JOURNAL

OF THE

Department of Agriculture

OF

WESTERN AUSTRALIA.

Vol. 20. (Second Series) DECEMBER, 1943. No. 4.

Preparation of the Wool Clip for Appraisement.

W. L. McGarry, Sheep and Wool Adviser.

To obtain full benefits under the Imperial Purchase Scheme a very careful "get up" is essential and many clips are not entering higher types during appraisement owing to inadequate preparation.

While the same basic principles still apply it has been found that under the Appraisement Scheme a greater reduction is made for fault in both wool and classing than was the case under the auction system of selling.

It has been found that in many instances the classing does not conform to the requirements of the various types as laid down in the Appraisers' Table of Limits. Only by carefully following the details laid down can the maximum results be obtained.

In order to secure maximum benefit from the Table of Limits under the existing scheme, it is absolutely essential:—

1. To exclude the odd tender fleeces from an otherwise sound line of wool.
2. To maintain even and regular length in each individual class.
3. To strive for uniformity of quality.
4. To keep separate the odd fleeces carrying excessive condition.

Length is Most Important.

Whilst some provision is made for mixed qualities (60/64's, 64/60's, etc.) there is no elasticity in regard to mixed lengths under the Table of Limits. Wools of mixed length go down in type (and limit) and *full value* for the longer wools in the bale is not obtained.

Under the Table of Limits there is a difference in the prices for average wools of 2d. per lb. (clean) between good length (warp) and medium length (half warp) which on a 50-60% yield is equivalent to 1d.-1½d. per lb.

This serves to illustrate the loss incurred by growers when the all important matter of evenness of length is neglected during the "get up" of the clip.

The minimum length of the staple required to qualify a wool for a "warp" type and so come under the maximum clean scoured basis in its respective group is set out hereunder:—

Minimum length 2¾ inches for 80's quality and finer.
3 „ „ 70's do.
3½ „ „ 64's do and broader.

According to the Appraisement Table of Limits a "warp" wool must be absolutely sound and regular. The term "half warp" is applied to wool having all the characteristics of a warp wool without its length.

Tender Fleeces.

In the Table of Limits there is a difference of 1½d. per lb. between a stylish spinners' wool and a good topmaking, but when the latter is tender it results in another 2d. per lb. deduction. In addition, when tender wool is in with sound, the whole lot is relegated to the lower type and the *full value* of the sound wool in the line is not realised. It is essential to keep tender wools separate from sound fleeces.

Quality.

Degrees of merino quality are: Fine, 70's; medium, 64's; strong, 60's.

Growers are advised when preparing their clips to class more in terms of fine, medium and strong rather than spending a lot of time in endeavouring to class out each fleece to strict quality. Exactness in quality is only achieved with years of experience and "border line" qualities are confusing to growers and difficult to determine.

Some of the main factors which reduce good wools to a lower type are mixed quality, mixed lengths, tender and sound together, careless skirting, mixed yielding wools together (i.e., mixing heavy fatty fleeces yielding 40-45 per cent. with good fleeces yielding 55-60 per cent.) and thin, short backs and sticky necks left in good types of sound fleeces.

Best results cannot be obtained for a clip unless the utmost attention is paid to the skirting and, when necessary, the removal of backs and necks from the fleeces. All fault such as seed or burr, stains, rough breech pieces and sweaty edges must be trimmed from the fleece. Almost invariably the back portion of the fleece is shorter, thinner, dustier and less attractive than the side and shoulder wool, and this being the case it must be carefully removed, otherwise the whole line will be relegated to a lower type, with a consequent lower appraised value.

Where weak and wasty backs are left in fleeces it is not possible for the wool so affected to be placed in a warp type.

The necessity for the utmost care and efficiency at the rolling table cannot be too strongly stressed, as it is at this stage that the initial and probably the most serious faults occur. It is impossible to lay down hard and fast rules regarding skirting as this depends largely on the season and the amount of skirting necessary depends, of course, on the conditions under which the sheep are run, and the amount of seed and/or burr, dust or foreign matter in the fleece.

Efficient and adequate skirting of fleeces from year to year must be left to the discretion of the classer and grower. To obtain the *full* benefit of skirting it is essential to *remove only all that is necessary* and leave intact on the fleece *all* that can be left. Heavy skirting, if not warranted, is unprofitable because much good length free wool finds its way to the piece bins with overskirting.

Some growers have the erroneous idea that the mere act of removing a skirting from a fleece is sufficient. Such is not the case. This removal has attended to the fleece, but has quite overlooked that portion of the fleece which has been removed. In this respect it is essential to remember that something is *gained* if the skirting is done correctly, but that something is also definitely *lost* if once having removed the skirtings and broken wools you neglect same by bundling them all in together. The importance of grading the oddments (PCS, BLS, etc.), cannot be over-emphasised because in some clips and in some years the oddments may represent up to 50 per cent. of the total clip. To obtain the maximum return per sheep, it is necessary to give these oddments the attention they warrant by grading them in the same manner as the fleece wool. If labour shortages at shearing time preclude the picking of pieces and grading of oddments, stack same in shed or pack temporarily until shearing is completed. Picking can then be effected and also during wet weather when the shearers are off the board.

A sound practice in classing is never to force a line of wool. This often occurs when "borderline" fleeces are encountered. That is if a fleece is encountered that is say half-way between the AAA (1sts) and AA (2nds) and matching is difficult, always put it down into the lower line. In this manner you are *increasing* the value of the lower line and retaining the evenness and consequently enhancing the value of the top line.

However, this practice should not be overdone because profitable classing calls for as much top line wool as possible. The necessity for forcing the lines will not occur, however, if the standard is set correctly at the commencement of the classing. It is *very necessary* to set the standard of the various lines according to the wool *before* you and not according to some preconceived idea of what AAA or AA (as the case may be) should look like.

After the lines have been "set" or in other words after the classer has decided in his mind's eye after an inspection of the first 30 or 40 fleeces what is to be AAA, AA, BBB and so on, the main considerations to remember are:—(1) Length, (2) Quality, (3) Soundness, (4) Yield.

Classing may be summed up in this phrase:—"Put wool where it fits and matches" and naturally evenness of length, quality and condition will be found together.

The number of lines to be made will be governed by the size of the flock and the condition and quality of each individual clip from year to year.

Discretion must be used as to the number of lines made as it is desirable not to cut a small clip up into too many lines. At the same time, however, the value of EVENNESS OF LENGTH AND QUALITY cannot be over-emphasised.

Tender wools must be kept out of sound lines. This is important.

Any irregular sorts which do not match any of the lines must be kept separate and placed in bags or butts.

Fleeces must be carefully skirted for sweat, stain, seed and burr.

Particular attention must be paid to the removal of geranium seedy jowls and cotts, as the presence of these will reduce good wools to a lower type with consequent loss to the grower.

Back wool where noticeably shorter and inferior in type to the remainder of the fleece should be removed. Brand the neck portion NKS and the remainder BKN.

Black tipped, heavy fatty fleeces must be kept separate from medium conditioned wools.

All rams' wool must be kept separate and branded as such.

The following classes are applicable to Agricultural and Southern merino clips. The number of descriptions used will be governed by the size, condition and quality of the clip being classed.

SUPER—Only to be made from clips which warrant description for style, quality and quantity.

AAA COM—Sound, good length, light conditioned, fine/medium quality.

AA COM—Sound, shorter, heavier, fine/medium quality.

A COM—Short and very heavy, also black tipped fleeces.

AAA FLC—Tender, good length, light/medium condition.

AA FLC—Tender, shorter, heavier condition.

(Any strong quality tender fleeces which do not match the last two descriptions should be placed in bags. If sufficient strong tender wool is encountered make a BBB FLC line.)

BBB COM—Sound, good length, light/medium condition, strong quality.

BB COM—Shorter, heavier, strong quality.

(Anything very rough, or doggy fleeces should be placed in bags or fadges. If sufficient for a bale and in strong quality clips a line of 58's can be made.)

AAA PCS—Longest, lightest and brightest.

AA PCS—Shorter and heavier.

(Breech pieces, very strong quality pieces and starey necks should be kept separate. In strong quality clips a line of BBB PCS can be made.)

(Pieces cotted with geranium seed should be packed entirely separate and not mixed through any of the above lines—Brand SDY PCS.)

It is important that all pieces be shaken thoroughly in order to eliminate second cuts and locks. Piece lines carrying second cuts and locks go down in type and lose 1d. to 2d. per lb. in value owing to the loss in length and the lower yield. It is equally important of course to thoroughly shake the locks in order to remove and secure full value for the pieces that are often mixed through the locks.

Piece picking can be effected with much more efficiency and speed if the breech skirtings are thrown in a basket or kept separate when the fleece is being skirted. This procedure saves double handling and automatically separates the stained strong, and inferior seedy breech pieces from the longer, freer, and brighter shoulder and side pieces.

BKN—The backs.

NKS—The longer, brighter and higher yielding neck portion.

AAA BLS—One line, skirted free of heavy sweat and stain. (Two lines may be made if the size of the clip warrants it. The second line, AA BLS will be the shorter, heavy conditioned BLS free of stain.)

STD PCS—One line minus dags, thoroughly dried.

LKS—One line, minus dags.

AAA LBS—Longest, brightest, light to medium condition, minus stain.

AA LBS—Shorter and heavier conditioned, minus stain (any rough, coarse lambs' wool to be placed in bags.)

Comeback and Crossbred Clips.

AAA CBK—Good length, light to medium condition comeback wool.

AA CBK—Shorter and heavier conditioned comeback wool, may include tender fleeces from AAA CBK.

AAA F XB—Good length, light to medium condition, fine quality crossbred wool.

AA F XB—Fair length, light to medium condition, may include tender fleeces from AAA F XB.

AAA XB—Good length, light to medium condition, medium quality—crossbred wool.

AA XB—Fair length, light to medium condition, medium quality—may include tender fleeces from AAA XB.

XB—Good length, light to medium condition, strong quality Crossbreds and long English breeds.

XB COM—A cast line, cotty, discoloured and rough fleeces.

SHROPSHIRE, DORSET, DOWNS AND SIMILAR BREEDS—Brand according to breed and bag if insufficient for a bale.

CBK PCS—Comeback and fine Crossbred PCS, minus sweats.

XB PCS—Medium and strong quality Crossbred PCS, minus sweats.

CBK BLS—Comeback and fine Crossbred BLS, minus sweats and stains.

XB BLS—Medium to strong Crossbred BLS, minus sweats and stains.

XB & CBK, STD PCS—One line, minus dags, thoroughly dried.

XB & CBK LKS—One line, minus dags.

CBK LBS—Fine quality, minus stain (two lines if necessary, according to length).

F XB LBS—Medium quality, minus stain (two lines if necessary, according to length).

XB LBS—Strong quality lambs' wool, minus stain.

Where flocks are mixed (Merino and Crossbred) always draft the sheep before shedding and treat the wool as two clips. This procedure will simplify and reduce the work involved in the wool room. Growers are strongly advised against mixing Merino and Crossbred wool in the same bales. Appraisers will order mixed fleece wools of such dissimilar type to be re-classed at the owner's expense before valuation can be effected. Mixed Crossbred and Merino pieces will relegate the lot to a lower type with a consequent loss to the grower.

Pressing and Branding.

Neat, well pressed bales facilitate handling, save packs and are a general all round advantage. When pressing it is advisable not to make the bales containing top line wool too heavy. It is an advantage also if the weights of such bales are kept fairly even and without a great variation in poundage. A reasonably high over all bale average is necessary to conserve wool packs, and this can be effected by increasing the weights in the lower lines of oddments.

The bales in the clip must be numbered consecutively from No. 1 on to the end of the clip, with oddments following on in sequence. Do not duplicate numbers in any one season.

A plain brand which is distinctive and bold should be used. The owner's initials over the name of the property are recommended. The initials serve as

a distinguishing mark, as many farm names are duplicated. The use of stencil plates is strongly recommended and small letters should not be used.

The brand, description and bale number must be clearly marked on the front *and top* of each bale. Do not brand on bottom of bale. Front of bale should be a side with a seam all round. Where no mechanical press is available, and fixed top packs are used, the same method applies, but *front* of bale should be opposite to side to which cap is attached.

The minimum weight of a "full weight" bale of greasy wool is 200 lbs.

It is essential that the classer or grower renders to the wool broker a report on the clip, giving the bale numbers of any "splits" in the flock, and stating whether a change has occurred in the wool. This could occur through a change in the type of country, a different paddock, or a change of flock during shearing.

Thrips, and their Relation to Spotted Wilt and Other Plant Injury.

C. F. H. JENKINS, Government Entomologist.

There are a large variety of thrips found in Western Australia, some are native species, but many are world-wide types which have been introduced, and of these several are of considerable economic importance. Although thrips are by no means specific as regards the plants attacked, different species show preferences for certain hosts, and so we have such popular names as apple thrips (*Thrips imaginis*), onion thrips (*T. tabaci*), carnation thrips (*Frankliniella insularis*), and gladiolus thrips (*Taeniothrips simplex*), for the species which habitually attack these plants.

As a matter of fact, the apple thrips and the onion thrips both attack roses and the onion thrips and the carnation thrips both may be found upon tomatoes and various other plants, so that the host plant is by no means a sure guide to the species of the insect.

GENERAL DESCRIPTION.

Thrips are minute elongate insects somewhere about $\frac{1}{16}$th of an inch in length, yellow, yellowish brown, brown or black in colour, according to the species. The adults possess two pairs of narrow wings fringed with long delicate hairs.

The wings are usually folded closely over the back and so are not easily seen. The immature thrips or nymphs are found feeding in the same situation as the adults, but are usually lighter in colour and devoid of wings.

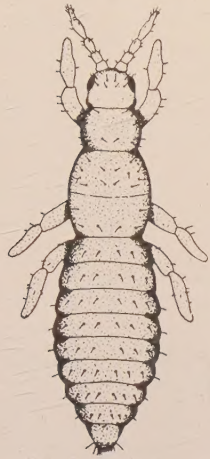
LIFE HISTORY.

The life history of the thrips will of course vary according to the species, but the general sequence of events is as follows:—

The female has a tiny saw-like organ called an ovipositor near the posterior end of the abdomen, and by means of this she makes slits in the leaf, stem or flower parts of the host and inserts minute white eggs in the tissues. The eggs

hatch in a few days and the immature thrips soon commence to feed. After feeding for several days the nymphs enter two resting stages known as the prepupal and pupal stages, both of which are passed in the soil. At the conclusion of these stages, the adult winged thrips emerge from the ground and soon set about the business of egg laying.

Under favourable spring and summer conditions the time required for the insect to develop from the egg to maturity is about three weeks, although under winter conditions the various stages of the life cycle may be greatly lengthened.



(Cal. Dept. Agric.)
Larval stage of gladiolus thrips (highly magnified).

(Cal. Dept. Agric.)
The adult gladiolus thrips (highly magnified).

TYPE OF INJURY.

Thrips injury may be manifested in two ways, due either to the actual feeding marks of the thrips or to the transmission of agents known as viruses. Feeding injury may be roughly classified into three types according to the parts of the plant attacked, namely, leaf injury, blossom injury, or corm injury. In feeding the insect rasps the outer surface of the tissues with its tiny mouth parts and sucks up the liberated juice. The injured parts become silvery or whitish, and this discolouration of both foliage and flowers is well known to gladiolus growers. As every apple and rose grower knows, when developing buds are heavily infested they may shrivel and fail to open.

VIRUS TRANSMISSION.

The damage caused by thrips in their role of virus carriers is even more important than the losses caused by feeding injury, and presents a problem which is much more difficult to solve. Just as malaria is transmitted from man to man by mosquitos, so may certain virus diseases be spread by thrips. *Spotted Wilt of Tomatoes* is the most important thrips borne virus in this State. It is carried by the yellowish onion thrips and the darker and less common black carnation thrips.

The control of spotted wilt is closely bound up with the control of thrips, for it is only by eradicating or keeping in check the carriers of the virus and by destroying diseased plants that the menace can be overcome.

CONTROL.

The control methods which can be used against thrips will vary according to the nature of the attack.

The apple thrip, which periodically causes poor setting of the fruit crop, is still an unsolved problem, for the plagues arise so rapidly and the areas covered are so large that although effective sprays and dusts are available the expense and difficulty of application is enormous.

In the case of crops such as gladiolus, celery, onions, and tomatoes, control measures can be more effectively applied. The treatments may be divided into two types, those involving contact dusts and sprays, and those consisting of poisoned sugar solutions. In carrying out any control measures it is necessary in most cases to commence the treatment as soon as the plants appear above the ground and before a heavy infestation has arisen. Especially is this so where it is desired to control virus disease, for a few infected insects may cause a great deal of damage.

In the case of tomatoes, seed beds should be regularly treated at least once a week and preferably twice, so that no serious infestation can become established before the plants are set out in the field.

BAITS.

The following sprays should be applied about once a week or even more often where it is necessary to reduce the thrip population to an absolute minimum:—

1. Tartar emetic, 1 to 2 oz.
   Brown sugar, 4 oz.
   Water, 4 gallons.

This spray has been used locally with very excellent results in controlling gladiolus thrips, and is reported to be of great assistance in reducing spotted wilt.

Tartar emetic is unfortunately sometimes difficult to procure, however, and the following alternative formulae are included:—

2. Paris Green, 2 oz.
   Brown sugar, 4 lb.
   Water, 5 gallons.

3. Manganese arsenate, 4 oz.
   Brown sugar, 4 lb.
   Water, 5 gallons.

Slight foliage injury may result from the use of the last two formulae, especially under humid conditions.

The following formulae have recently been found very effective substitutes for tartar emetic sprays in America, and although they have not yet been fully tested out locally they are included for the benefit of growers who may feel disposed to try them:—

1. Nicotine sulphate, 1 quart.
   Honey, cane syrup, or corn syrup, 3 gallons.
   Water, 83 gallons.

2. Paris Green, 7 ozs.
   Molasses, 2 quarts.
   Water, 83 gallons.

In addition to the above, another substitute worthy of trial on some plants is the formula, commonly used for fruit fly baiting:—

Sodium fluosilicate, 1 oz.
White sugar, 2½ lbs.
Water, 4 gallons.

This spray will severely burn gladiolus foliage and certain other plants, but preliminary experiments have shown it not to affect tomatoes, and in the absence of other insecticides growers may feel disposed to test this material.

Dusts.

1. Tobacco dust, 1 part; slaked lime, 2 parts; flowers of sulphur, 1 part.
2. Kaolin or talc, 70 parts; Derris powder, 20 parts, pyrethrum, 10 parts.
3. Pyrethrum, 1 part, flowers of sulphur, 9 parts.
4. Flaked naphthalene.

Contact Sprays.

1. Nicotine sulphate or black leaf 40, 1½ teaspoonsful; soap, 1 oz.; water, 1 gallon.
2. Nicotine sulphate, 1½ teaspoonsful; prepared white spraying oil, ⅕ pint; water, 1 gallon.

Treatment of Gladiolus Corms.

1. Immerse in warm water 120 deg. F. for 10 minutes, or 112 deg. F. for 30 minutes. Care should be taken to see that the temperatures are not exceeded.

2. Place corms in a paper bag or box with flaked naphthalene at the rate of 1 oz. to every 100 corms. Leave containers closed for about three weeks or a month then remove naphthalene.

3. Dip just before planting in solution of corrosive sublimate 1 oz. to 6 gallons.

Cultural Methods.

As in the control of most other pests, garden hygiene will play an important part in checking thrips injury and thrips borne diseases. Neglected plants and weeds are a harborage for the pest and in many cases may also be infested with spotted wilt, with the result that they are a potential menace to any susceptible crop cultivated in the vicinity. Crops very liable to thrips damage are best grown in as isolated a position as practical, for thrips have been known to fly 200 feet under calm conditions, and with the aid of the wind this distance could be increased greatly.

Self Feeders—A Method of Reducing Labour in Pig Raising.*

M. CULLITY, Superintendent of Dairying.

The rapid expansion of pig raising is one of the greatest needs at present facing Australia and this State is being called on to produce a very big part of the pig-meats to be supplied to Great Britain under contract.

* Incorporating information supplied by R. R. Rutherford, M.D.A., Farm Manager, Muresk Agricultural College; C. R. Dixon, M.D.A., Piggery Instructor, Muresk Agricultural College.

Fortunately this State has a large potential for pig production both in the wheat and dairying areas, although it is in the former that the most rapid expansion is possible.

The Commonwealth Government has announced a plan which guarantees prices which are a very substantial advance on those operating before, for a period of at least two years. In normal times such a plan would undoubtedly immediately lead to increased output. At the present time the major difficulty of shortage of labour is a tremendous handicap and unless this is overcome the promise of good prices will not achieve its object.

Fortunately the labour required for feeding and handling pigs can be reduced by thoughtful organisation of the feeding methods and the lay-out of the premises.

There are various types of self feeders available on the market which can be adapted for pig-feeding, but two types which can be made by the farmer himself are described in the following notes:—

1. Self-feeders which have proved successful at the Muresk Agricultural College are made from old 44-gallon oil drums. Both ends of the drum are removed: four L-shaped pieces of iron, which act as legs and keep the drum raised 1½ inches from the base of the feeder, are bolted to the drum: an old implement wheel tyre (such as a binder wheel tyre) filled with 3 in. of reinforced concrete is used as a base (diameter of the base would be 18 inches greater than that of drum). This allows 9 in. all round the drum for feeding.

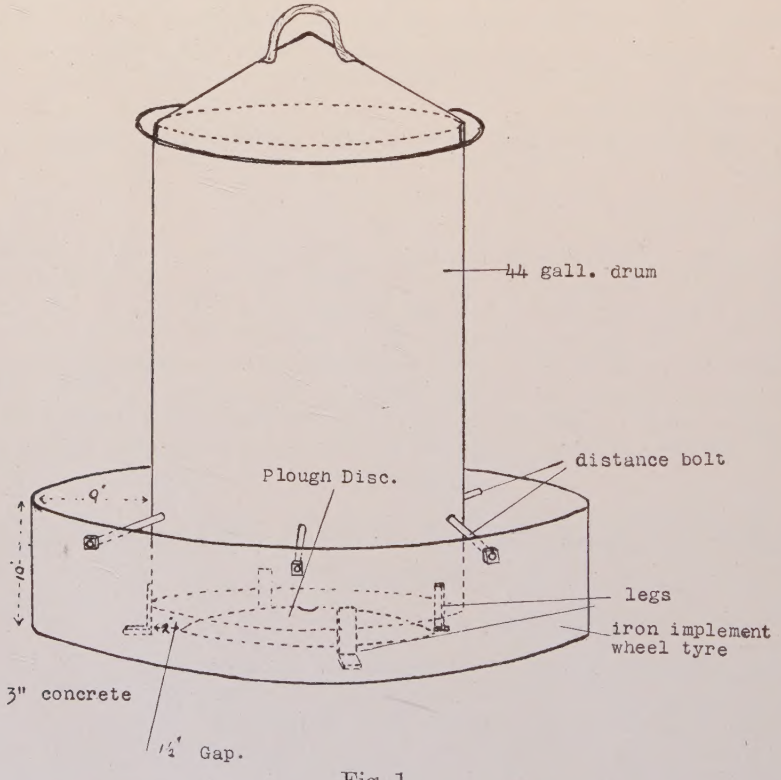


Fig. 1.

To allow the feeder to empty out, an old plough disc or cone should be placed in the centre of the base. This will carry the feed to the tray. The ideal width of the tyre used for the base is 10 in., as narrower types allow feed to be scattered and wasted. The drum is stood in the centre of the base and secured with four distance bolts. The provision of a lid for the drum completes the self-feeder (see figure 1). This size self-feeder has the advantage over larger types in that it can easily be moved to clean ground.

It has been found an advantage to have the feeder on a wooden platform 6 ft. x 6 ft. built in the form of a sledge to facilitate moving when necessary. Another advantage is, during wet weather pigs do not carry slush on their feet into the self-feeder and thus cause it to stop running.

2. Another type has already been described in this Journal (December, 1940).

"The Feed Trough.

The self-feeder rests on two 4 in. x 2 in. skids provided with two strong flat iron draught lugs, which render it portable. Three 4in. x 2in. bearers are then notched over the skids. On top of these bearers the feed trough is formed, the bottom being 10 in. x 1 in. and the sides 5 in. x 2 in. on the edge bolted to bearers with ⅜ in. bolts through the skids and bearers. Two pieces of 8 in. x 1 in. wood placed at 45 degrees form the centre or back of both troughs, and two pieces of 5in. x 1in. wood placed at 45 degrees from the 5in. x 2in. sidepieces to the bottom board complete the feed trough.

The Bin.

The bin, or hopper, is constructed of wood. The frame is made of 3 in. x 2 in. uprights with 3 in. x 1 in. across the top. Rafters of 2 in. x 2 in. and 4 in. x 2 in. ridge. The top is sheathed with 6 in. x ⅞ in. tongue and grooved boards; one side of the top acts as the door, which is composed of 6 in. x ⅞ in. tongue and grooved board with two 6 in. x 1 in. ledges. The door and top are covered with flat iron: hinge door with three strap hinges.

The top should project well over the trough, so that water will not drip into it. The side and end of the bin should be sheathed with 6 in. x ⅞ in. tongue and grooved boards. The bin is supported by 2 in. x ⅜ in. iron straps bolted to trough and to bin.

The slide and hinged flap are regulated with a slot and bolt and screw; the bottom of the slide is hinged with strap hinges. The slide is 8 in. x 1 in. wood, the flat 4 in. x 1 in. wood, with a strip of tin or light iron 3 in. wide to cover the crack. The whole structure measures 6 ft. long x 3 ft. wide, the eaves projecting 6 in. all round."

3. Mr. G. Moullin of Mukinbudin has in use a self-feeder made from a 1,500 gallon tank. He has built a cone approximately two feet high in the centre and has bolted to the base four trays. From the centre of the cone pieces of ⅜ in. iron pass through 1 in. holes. The pieces of iron project into the tray and are turned up so that the pigs agitate the wheat, so causing it to flow.

Number of Pigs per Feeder.

As a general rule four pigs can be fed for each linear foot of feeding trough; for example—in a feeder with trough 5 ft. long on each side, it would be possible to feed 40 growing pigs.

Door Closed
Door Open
6" T&G Boarding
2-8"
3x2
2-8"
3x2
2-2½" Iron Strap
Strap Hinges
17"
4x2"
3'-0
4x2 Skids
3'-0"
Section
3" Tin Strip to Cover Crack
Detail of Slide and Hinged Flap.

Fig. 3.

7-0
6'-0"
Front Elevation

Fig. 2.

In the feeder referred to as type 2 above, the hopper would have capacity to hold sufficient grain for 40 pigs nearing baconer weight for four to five days.

In the type 1 feeder, as used at Muresk College, it was found possible by filling the hoppers five times per week with a mixture of crushed wheat, barley and ten per cent meatmeal to feed 38 mixed pigs; 25-30 porkers or 20-25 baconers.

It will be appreciated that by increasing the number of feeders and so reducing the number of pigs per feeder, the need for refilling the hoppers will not be so frequent.

Rations to be Used.

Experiments conducted at the College have shown that a protein supplement such as meat-meal should be used with wheat and as a general recommendation when other forms of supplement are not available, it is advised that the wheat and meatmeal should be provided in the proportion of 9 : 1.

However for several months in each year it is possible to allow pigs access to grazing of green pasture or cereal crops. In this way the requirements for protein in the feeder are reduced and a ratio of 20 of wheat to one of meatmeal will be found sufficient. It will be found however, that semi-mature or mature pasture or fodders will not give the same result, due to the lower protein content and the increased amount of fibre. The provision of ample protein in the early months is necessary in order to allow the young pigs to develop a large skeleton with an ample covering of muscle.

Many farmers are following the practice of eliminating meatmeal from the ration in the latter months of the feeding of a bacon pig and while they may be producing pigs of satisfactory weight, the indications are that this method tends to produce a pig with too high proportion of fat to lean meat.

When meatmeal is in short supply, linseed-meal can be used to replace portion and the ratio could then be meatmeal and linseed-meal in the proportions of 27 : 2 : 2 in the absence of grazing, or 27 : 1 : 1, where grazing is available.

Further labour can be eliminated by providing the grain and supplements in separate compartments or in separate feeders. For example—in the type-2 feeder, a partition can be introduced one foot from one end and used for meatmeal while the remainder of the hopper is filled with grain. It will be found that the pigs will take the protein supplement in quantities to allow rapid growth and in a proportion to wheat very little different from that recommended for use when the ration is mixed.

Mineral supplements can be provided by adding 2 per cent. of limestone to all mixed rations or by placing a supply of limestone in a box near the feeder where the pigs will take what they require.

Preparation of grain.

Although pigs will use grain with greater efficiency in producing meat when crushed, the work of gristing requires considerable labour and time. In the present circumstances, therefore, a considerable saving can be effected by using whole grain. It will be found that although some increase in the quantity required will occur, satisfactory pigs will be grown.

Preparation of young pigs for self-feeding.

It is essential in order to provide for maximum development of suckers and to avoid check to growth at weaning that the young piglets be provided with feed

apart from the mother. This may be accomplished by penning off a small trough in the corner of the breeding pen, or yard, by means of a hurdle wide enough between the bottom rails to allow the piglets access to the trough and close enough to keep out the sow. The creep-feeder should be made available to the piglets when two weeks old and its use be continued until weaning, allow approximately ¼ to ½ lb. feed per head per day at two weeks and increasing the rate to 1-1½ lbs. at weaning or 8-9 weeks old. Suckers given access to creep-feeders will thus become accustomed to supplementary dry feed, be brought to maximum weights at weaning time, and suffer less check when weaned. The value of creep-feeding, therefore, cannot be over emphasised.

Water supplies and shelter.

Apart from the economy of allowing the pigs access to green grazing, there are two other points which demand attention by the farmer planning to adopt a system of self-feeding. These are the provision of water and shelter. All animals require water to maintain their bodies and to allow growth. In the summer months their needs are greater. The provision of clean wallows is a further advantage, particularly for sows with pig or litters.

Suitable accommodation to protect the pigs from the sun in the hot weather and to provide warmth in the winter months is also needed. Simple brush shelters as illustrated in Fig. 3 are satisfactory in the summer months. For winter, shelter walls are needed to shield the pigs from cold winds.

Portable feeders may be moved in the summer to shady places and in winter to where windbreaks are available.

Some results at Muresk.

At the College a mixture of crushed grain with 10 per cent. meatmeal and 2 per cent. dicalcic lick is used.

1. Twenty-one weaners comprised of approximately even numbers Tamworth and Berkshires and Tamworth-Berkshire cross, were fattened by the use of a self-feeder and sold on 12/5/43. They had access to green grazing over the last 2½ months. They sold as follows:—6 heavy baconers at 100s. each; 9 heavy baconers at 97s. 6d. each; 5 heavy baconers at 94s. 6d. each, and 1 light baconer at 88s. 6d. Average 97s. 1d. each.

2. Twenty-six weaners were fattened by the use of a self-feeder during the summer and sold 18/3/43 (mixed culled pigs) with no access to green grazing:—21 baconers at 89s. 6d. each; 1 baconer at 93s. 6d.; 2 baconers at 75s.; 1 light baconer at 68s.; 1 baconer at 85s. 6d. Average 87s. 6d.

3. A group of 10 pigs were sold 7/6/43 and averaged 104s.

4. Culls from stud—14 baconers, hand-fed, sold 27/10/43 averaged 82s. 1d.; 4 baconers at 76s.; 1 baconer at 80s.; 9 baconers at 85s.

Results at Mukinbudin.

A recent communication from Mr. G. H. Moullin, "Cookabin," Mukinbudin, showed that without help he was able to handle approximately 140 pigs in addition to 700 sheep.

Mr. Moullin states that he has nine sows which are kept together until they are due to farrow, when they are separated and kept in sties nine feet wide by 25 yards long. He used cyclone pig-netting, strained tightly, and has found this very satisfactory.

The young pigs are weaned at 8-10 weeks, are wormed with "Wurmozol" and put into a 50 acre paddock with self-feeder, trough and ball tap and 25 acres of crop sown for them. They stay there until brought down as baconers.

About 70 to 100 pigs of all ages are run in this paddock and the self-feeder which has a capacity of 38 bags is filled approximately once a month with whole wheat.

Mr. Moullin further states that at first he followed the practice of crushing the wheat and adding four bags of meatmeal. He found this method was definitely better, but now he has not sufficient time to do it.

He has a Horwood-Bagshaw grister, a home-made 9ft. elevator and has put through 80 bags on a summer afternoon. The elevator directs the gristed wheat into a tank. The work of gristing is carried out without assistance. This farmer states that the trays of the self-feeder should be level with the outlet in the container and not lower as so many are: in this way no wheat is soured or wasted. About 500-600 bags of wheat are used in the year.

From the foregoing there can be no doubt that self-feeders can be used in such a way so as to reduce the amount of work required in feeding pigs to the occasional filling of the hoppers and the loading of the pigs for market.

Some Organic Manures used with Vegetables.

L. T. Jones.

In order to obtain maximum efficiency in vegetable production with the supplies of fertiliser available, the Department of Agriculture has recently commenced a programme of experiments in collaboration with commercial growers in the metropolitan area. These experiments have been designed to test the value of various fertilisers applied at different rates and in a number of combinations. The most important organic fertilisers used in these experiments, or in adjacent commercially grown crops, have been analysed to determine their composition so that plant food equivalents of each dressing could be calculated and the responses examined in this light.

THE ORGANIC MANURES ANALYSED.

1. *Scouring Works Waste.*

This material consists of the sediment remaining in the vats when the wool is washed with potash soaps. The sample examined appeared to consist mainly of sheep manure and wool, but different batches are liable to vary in composition.

2. *Barley Combings.*

Barley combings are a by-product of the malting industry and consist of the dried sprouts of the malted barley grain.

3. *Blood and Bone Manure.*

This manure is produced from slaughter-house waste and includes blood, bone, and animal flesh.

METHOD OF REPORTING THE ANALYSES.

The estimations are expressed as percentages of nitrogen (N), phosphoric acid (P_2O_5), and potash (K_2O). These analyses become more intelligible when nitrogen is expressed as sulphate of ammonia, phosphoric acid as superphosphate, and potash as sulphate of potash. For convenience of comparison the estimations have been calculated to show the equivalent of one ton of the organic manure, at the normal moisture content as applied in the field, in terms of the corresponding commercial fertilisers.

ANALYSES OF MANURIAL CONSTITUENTS ON NORMAL MOISTURE CONTENT BASIS.

(Analyses carried out in the Government Chemical Laboratory.)

Fertiliser.	Scouring Works Waste.	Barley Combings.	Blood and Bone Manure.
	%	%	%
Nitrogen (N)	2·22	4·27	5·11
Phosphoric Acid (P_2O_5)	0·53	1·41	15·69
Potash (K_2O)	3·04	2·12	0·25
Moisture	...	14·12	...

EQUIVALENT AMOUNTS OF ARTIFICIAL FERTILISERS IN 1 TON OF THE MATERIAL.

Fertiliser.	Scouring Works Waste.	Barley Combings.	Blood and Bone Manure.
	lbs.	lbs.	lbs.
Sulphate of Ammonia (20% N)	249	478	572
Superphosphate (18% P_2O_5)	66	176	1,953
Sulphate of Potash (48% K_2O)	142	99	12

COMMENTS ON THE MANURIAL VALUE OF THESE ORGANIC MANURES.

Plant Food Concerned.	Scouring Works Waste.	Barley Combings.	Blood and Bone Manure.
Nitrogen	Fair	Fairly good ...	Good
Phosphate	Low—needs supplementing	Supplementing with super. generally an advantage	High—but slow acting.
Potash	Fairly good ...	Fair	Poor

RESPONSES OBSERVED WITH THESE MANURES.

1. *Scouring Works Waste.*

Some cauliflowers grown with this manure were suspected of showing potash deficiency symptoms. Potash manures were applied late in the season but did not remedy the trouble. Analyses of healthy and affected leaves gave similar potash

contents. Later the use of this manure with turnips resulted in too vigorous top growth. The analysis indicates that a better balanced manure would result if superphosphate were applied in addition.

2. *Barley Combings.*

In a recent fertiliser experiment it was observed that cabbages receiving no potash showed severe potash deficiency symptoms, while adjacent commercially grown cabbages receiving about one ton per acre of barley combings showed only slight potash deficiency symptoms. From the analysis of this material it is evident that the cabbages were able to obtain a fair supply of potash from the barley combings.

3. *Blood and Bone Manure.*

Blood and bone manure has always been a favourite with orchardists, vignerons, and vegetable growers and this preference may be explained in part by the following facts.

In a fertiliser experiment with cabbages located on a black peaty soil there were indications that blood and bone manure owed part of its superiority to the fact that it contains, to some extent at least, the necessary minor elements for continued maximum plant growth on this soil type. It was found that under these soil conditions mineral fertilisers, plus minor elements, were practically as effective as blood and bone manure.

The additional elements applied along with the normal mineral fertiliser (consisting of superphosphate, nitrate of soda, and sulphate of potash) were magnesium as Epsom Salts, copper as bluestone, manganese as manganese sulphate, and zinc as zinc sulphate.

For purposes of comparison the blood and bone used in these experiments was analysed for magnesium, copper, manganese, and zinc.

The experimental evidence is not complete enough to be able to point definitely to any one element as being directly responsible for the better growth of cabbages on this black peaty soil. However, the probable importance of magnesium (supplied by Epsom Salts) to sustain maximum crop yields under certain conditions is now being more fully realised. The zinc content is higher than one would normally expect from an organic material but this may be due to contamination.

ADDITIONAL ELEMENTS IN THE BLOOD AND BONE SAMPLE.

Element.	Analysis.
Magnesium (Mg)	0·35%
Copper (Cu)	13 parts per million
Manganese (Mn)	12 parts per million
Zinc (Zn)	160 parts per million

EQUIVALENT AMOUNTS OF THE CORRESPONDING CHEMICAL SALTS IN 1 TON OF THIS BLOOD AND BONE MANURE.

Commercial Chemical Salt.	1 Ton of Blood and Bone Manure Contains :
Epsom Salts (9·9% Mg)	80 lbs.
Bluestone (25·4% Cu)	2 ounces
Manganese sulphate (14% Mn)	3 ounces
Zinc sulphate (26·4% Zn)	22 ounces

THE INTERPRETATION OF THE ESTIMATIONS.

1. *Relative Availability.*

It should be borne in mind that the nitrogen, phosphate, and potash in these manures is in an organic form and would not be as readily and as rapidly available to the plant as in the form of the corresponding artificial fertilisers. Depending on conditions this difference in availability can be an advantage or a disadvantage. Where leaching is severe, nitrates and ammonia would be liable to washing out and nitrogen in the less soluble organic form would, in this case, be an advantage.

2. *Plant Food Delivery.*

The delivery of plant food in an organic manure being brought about by soil micro-organisms is a continuous process, the rate depending on the activity of the micro-organisms. As plant food is being released over the period of decomposition, the plants tend to be fed regularly rather than spasmodically. This aspect of plant nutrition is very important when the supply of nitrogen to the plant is concerned.

When a high grade organic manure is added to a vegetable crop at planting time, there is a tendency under suitable conditions for the peak in plant food production to coincide with the plants maximum needs. It has been stated, that, for potatoes, the period of maximum uptake of plant food is 50 to 80 days after planting. The quicker-acting artificial fertilisers if applied at the wrong time, may be lost to the plant or even be harmful if in excess. This applies especially in the case of very soluble nitrogenous fertilisers such as nitrate of soda.

ORGANIC MANURES VERSUS ARTIFICIAL FERTILISERS.

Artificial fertilisers are extremely efficient sources of plant foods, such as nitrogen, phosphate, potash, copper, magnesium, etc., and if properly used are at least equally as effective as organic manures. Quick-acting artificial fertilisers will often produce crop yields which are impossible with the less flexible organic manures.

Numerous fertiliser trials show that considerable latitude is permissible in the amounts and proportions of artificial fertilisers that may be applied without harming the plant or the soil. As our experience and skill increases there is no reason why artificial fertilisers should not produce vegetable crops as good or even better than organic manures, so long as the humus content of the soil is kept at a satisfactory level.

The addition of sufficient humus to the poor sandy soils encountered around Perth is very important for successful vegetable culture. One of the major advantages of the addition of organic matter is the improvement in soil structure, so that the soil becomes a better medium for plant growth. However, to raise the organic matter content of a soil appreciably, very large quantities of animal manure, vegetable waste, compost, green manure crops, etc., need to be applied.

ASSESSING THE VALUE OF ORGANIC MANURES.

Taking into account the points discussed previously, and the fact that we are concerned mainly with the supply of plant food to the immediate crop, the vegetable grower would assess the value of a particular organic manure along the following lines:—

Nitrogen.

Generally speaking, the vegetable grower pays primarily for a fairly concentrated form of nitrogen in his organic manures. The more concentrated forms

of organic nitrogen carry with them the following possible advantages: (1) lower transport costs; (2) ease of application; (3) suitable availability of the plant food. These conditions are fulfilled in such manures as blood and bone, dried blood, and high grade animal manures.

Potash.

Possibly his next consideration is the potash content of the organic manure. Normally where potash is deficient this can be readily remedied by applying sulphate or muriate of potash. When potash fertilisers are unprocurable the readily available potash content of the manure assumes greater importance, especially for crops like cabbages, tomatoes, cauliflowers, and potatoes. Manures supplying readily available potash, in varying degrees, include scouring works waste, barley combings, unleached wood ashes, urine, and high grade animal manures.

Phosphate.

Phosphate can usually be supplied most cheaply and in a more readily available form by the use of superphosphate. As a general rule the manurial value of most animal manures is improved by the addition of superphosphate.

Dehorning—Its Advantages and Practice.

R. R. Rutherford, Farm Manager, Muresk Agricultural College.

To appreciate the value of dehorning one must consider fully the damage done daily by cattle which are horned and the resultant losses of revenue which follow such damage.

Bruising through close yarding may be said to be the main factor affecting horned beef cattle, and as a bruised carcase is worth so much less than one free from any blemishes the use of hornless cattle for this purpose cannot be too strongly recommended.

The fact that dairy cattle are allowed to remain horned may in many instances be—

(a) the cause of mammitis;

(b) the cause of lack of condition, inability to produce to a maximum and general nervousness which makes the animals difficult to handle.

Dehorned cattle on the other hand are tractable and can be close yarded in large numbers without damage. Young cows feed contentedly and quietly beside former boss cows of a herd. There is a marked decrease in udder injuries and resulting loss of production. Bulls are less dangerous to handle and finally the practice of dehorning gives uniformity of appearance to a herd. In fact it may be said that there is no factor which gives ample justification for the retention of horns in a dairy herd.

Cattle may be dehorned (a) as calves; (b) as mature animals.

(a) The practice of dehorning calves is one which can be followed when the complete herd is dehorned and is one which gives the minimum check to the animal. When the calf is 8-10 days old and the horn bud or button can be located, the hair should be clipped from round its base and vaseline rubbed over the clipped area to within one-eighth to a quarter of an inch of the bud. (This will

prevent the caustic soda spreading.) The button is then damped and rubbed over with a caustic soda stick held in a piece of thick brown paper. When a raw chafed appearance is produced, the operation is complete providing care has been taken to ensure that the caustic stick has made contact with the ring of skin one-eighth to a quarter of an inch around the base of the button. This is most important because it is in this area that the horn-producing tissue lies, and failure to treat it will result in recurring growths of horn which will need cutting off with a knife and re-treating when they appear.

When the operation is completed, turn the calf into a fair sized yard or paddock so that it is not interfered with by other calves. A scab will form where the bud was located and this will come away in due course leaving the animal hornless.

Avoid wet weather, which will cause the caustic soda to run and injure the calf.

Fig. 1.

(b) Where mature cattle require dehorning a strong bail is essential. For preference this should be located at the end of a race where the operator can move freely on both sides of the animal (see Fig. 1). A bucket of disinfectant (2 per cent. lysol solution) in which to place the dehorners after each operation, a nose grip and a length of rope to act as a breeching are all that is required. The animal is brought into the bail, the breeching is placed behind it and held as in Fig. 1, to keep the animal forward. An assistant grasps the animal by the nose and turns the head to one side as in Figs. 1 and 2. This allows the operator to place the dehorners over the uppermost horn with the flat side of the guillotine down, and open them sufficiently wide to take a ring of skin and hair one-quarter to one-half inch wide surrounding the base of the horn as in Fig. 2 (see diagram of correct cutting). One handle of the dehorners is rested on the operator's thighs (Fig. 2) leaving both hands free to apply leverage to the other handle and remove the horn (Fig. 1). In obstinate cases where the horn is particularly hard, the horn should be circled with the blades part clenched; this will cut a ring around the horn after which it will be found to come away freely. The assistant then reverses the head and the other horn is treated similarly. A little stockholm tar or boracic acid placed adjacent to the wound will act as a deterrent to flies.

The animal may now be released.

Fig. 2.

Bleeding following the operation does not last long but obstinate cases may be plugged with cotton wool or seared with a hot iron. If it is possible, the operation should be carried out when the cows are dry, although cows in milk may be treated without sustained loss of production. It is advisable to avoid wet weather and periods when flies are bad.

Healing takes place rapidly and in this connection Muresk Agricultural College Guernsey herd may be cited. The herd was dehorned and four weeks later cows from it were shown successfully (completely healed), at the Perth Royal Show.

LINE OF CUTTING.

Correct. Incorrect.

Studies in Sheep Husbandry in W.A.

IV.—The Influence of a High Level of Prenatal Feeding in Lamb Production.

E. J. Underwood, F. L. Shier, and H. G. Cariss.

In an experiment conducted during the 1941 season (Underwood and Shier, 1942), a group of 150 Border Leicester x Merino ewes, mated to Southdown rams, was grazed under poor nutritive conditions so that they were judged to little more than maintain their live weights throughout the last third of pregnancy. A similar group of ewes was grazed under the same conditions but received in addition a small "practical" supplement of ½ lb. wheaten grain per sheep per day for the last 6-8 weeks of pregnancy. The extra feeding given to the second group of ewes had no effect on the birth-weight of the lambs, either singles or twins, compared with those from the "unfed" ewes. There was also no effect on subsequent rate of growth of the lambs or on carcase quality, as determined by ordinary grading or by a series of external carcase measurements. The small supplement of grain, however, produced a highly significant reduction in losses of ewes and lambs before and after lambing. In addition it was found that in both groups the heavier lambs at birth grew faster than the lighter. On the average each increase of 1 lb. in birth-weight reduced the time taken for the lamb to reach a live-weight of 65-70 lbs. by approximately one week.

Both these positive findings were considered to be of such practical importance that further investigation was warranted. In particular it was felt that the influence of a much heavier level of prenatal feeding should be tried in order to find out how far it was possible by this means to raise the birth-weight of the lambs and how far any such increase in birth-weight would be reflected in a faster rate of growth and improved carcase quality. The importance to the lamb raiser of having his ewe and lamb losses reduced to a minimum and his lambs marketed as early as possible is so obvious as to need no further emphasis.

Accordingly, experiments were carried out at the Avondale Research Station, Beverley, during the 1942 and 1943 seasons with the object of obtaining further information on these and allied questions. The results of these experiments are described below.

EXPERIMENTAL PROCEDURE.

The procedure was essentially similar to that used in the 1941 experiment (Underwood and Shier, 1942). In both 1942 and 1943 all the ewes were mated with rams raddled on the brisket and the marked (i.e., mated) ewes taken off twice weekly and the service dates recorded. From these, two even groups, all due to lamb within a restricted period, were selected and run as one flock until the differential feeding treatments of the two groups commenced. In each year any ewes which did not lamb during the expected period were eliminated from the experiment. The ewes were inspected twice daily at lambing and all the lambs weighed to the nearest ounce, eartagged and recorded. Thereafter the ewes and lambs from both groups were run as one flock. The lambs were weighed at frequent intervals until they reached a live-weight of 65 lbs. All lambs were tailed and the males castrated when 3-5 weeks old.

FEEDING AND GRAZING DETAILS.

1942 *Season.*

It was originally decided to provide the ewes of the fed group with a heavy supplementary ration of oats and linseed nuts during the prenatal period. The

abnormally early autumn rains with the resultant early green feed, however, necessitated a modification of this plan. It was decided to exploit the earliness of the season by grazing the fed group on an early sown crop of barley, which supplied ample quantities of high quality feed. The control ewes were grazed on a restricted area carrying mainly sparse Wild Geranium (*Erodium botrys*) and Barley Grass (*Hordeum maritinum*). The ewes of the fed group made large weight gains on the green barley, whilst the control ewes did little more than maintain their live-weights over the prenatal period of differential treatment (Table I.).

1943 *Season.*

Early opening rains were again experienced, but it was possible to arrange the paddocking so that the basal grazing of geranium and barley grass, etc., although green, was restricted in quantity for both groups. The ewes of the fed group were given a supplement of ½ lb. wheat plus ½ lb. linseed nuts per head per day for the last 7-9 weeks of pregnancy. The groups were alternated between the two paddocks weekly. Although the grazing in the two paddocks was similar in character at the commencement of the feeding treatments, it apparently became less in one during the experiment, as the fed group, in spite of the supplementary feeding given, lost in weight during the period 4th May, 1943 to 18th May, 1943. This was in all probability the reason for the loss of three ewes from pregnancy toxaemia in the fed group. During the last fortnight both groups received a supplement of ½ lb. of cereal hay per head per day to help make good the diminishing paddock grazing. The mean weights of the ewes in the two groups are shown in Table I. The control ewes did not quite maintain their live-weights over the period. The fed group made an average gain of 20 lbs. during the feeding period, compared with about 30 lbs. for the similar period in the previous year's experiment.

Table I.

Live Weights of Ewes (number of Ewes in brackets).

——	6-4-42.	28-4-42*.	12-5-42.	26-5-42.	5-6-42†.	16-6-42.	24-6-42.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Controls	122 (167)	119 (167)	119 (167)	120 (167)	126 (160)	113 (118)	117 (42)
Fed Group	121 (173)	119 (173)	125 (173)	136 (173)	142 (173)	152 (132)	151 (47)
——	6-4-43.	20-4-43*.	4-5-43.	18-5-43†.	2-6-43.		
	lbs.	lbs.	lbs.	lbs.	lbs.		
Controls	118 (183)	114 (183)	113 (181)	113 (169)	111 (83)		
Fed Group	117 (185)	115 (185)	125 (183)	124 (181)	135 (92)		

* Differential feeding commenced. † Lambing commenced 8th June, 1942 and 20th May, 1943.

In both 1942 and 1943 the ewes and lambs from each group were grazed on abundant green crops and pasture immediately after lambing.

RESULTS.

Effect of Feeding Treatment on Ewe and Lamb Losses.

All losses of ewes and lambs from the experimental groups were recorded from the beginning of the differential feeding treatment, i.e., 7-9 weeks prior to lambing, until the tailing of the lambs at 3-5 weeks of age. The combined results for 1942 and 1943 are presented in Table II.

Table II.

Losses of Ewes and Lambs 1942 and 1943.

Treatment.	Total No. of Ewes.	Ewe Losses.			Lamb Losses.			Total No. Lambs Tagged.
		Pregnancy Toxaemia	Other Causes.	Total.	At or before Birth.	Shortly after Birth.	Total.	
Controls	350	26	2	28	*60	11	71	328
Fed Groups	358	3	1	4	*14	6	20	395

* Including twins and singles lost with ewes dying from pregnancy toxaemia.

Statistical analysis of these results shows that the extra food supplied to the ewes during the last third of pregnancy has had a highly significant effect ($P < 0.01$) in reducing losses of both ewes and lambs.

Effect of Feeding Treatment on Birth-weight and Growth-rate of Lambs.

The mean birth-weights of the lambs and the number of days taken to reach a live-weight of 65 lbs. are presented in Table III. It should be noted that the mean birth-weights are for all lambs born alive. Some of these lambs died before reaching the required live-weight, some were lost by accident or for other experimental purposes or, as in the case of the twins, failed to reach 65 lbs. live-weight within reasonable time limits.

Table III.

Birth-Weight (lbs.) and Growth-Rate of Lambs.

(Numbers in brackets.)

Group.	1942.		1943.	
	Mean Birth-Weight.	Age at 65 lbs. live weight.	Mean Birth-Weight.	Age at 65 lbs. live weight.
	lbs.	days.	lbs.	days.
Singles—				
Controls Wethers	9·9 (65)	90 (61)	9·1 (81)	88 (77)
Controls Ewes	9·2 (67)	96 (58)	8·6 (73)	103 (69)
Fed Wethers	10·9 (70)	85 (67)	10·8 (86)	86 (80)
Fed Ewes	10·1 (64)	93 (60)	10·3 (82)	94 (81)
Mean of Controls (Ewes and Wethers)	9·5 (132)	93 (119)	8·9 (154)	95 (146)
Mean of Fed (Ewes and Wethers)	10·5 (134)	89 (127)	10·5 (168)	90 (161)
Twins—				
Controls Wethers	7·4 (17)	107 (9)	8·1 (7)	119 (5)
Controls Ewes	6·4 (15)	114 (3)	6·9 (3)	137 (2)
Fed Wethers	9·8 (40)	99 (35)	9·7 (6)	99 (3)
Fed Ewes	9·2 (35)	104 (25)	9·1 (12)	117 (9)
Mean of Controls (Ewes and Wethers)	6·9 (32)	109 (12)	7·8 (10)	124 (7)
Mean of Fed (Ewes and Wethers)	9·5 (75)	101 (60)	9·3 (18)	112 (12)

Statistical analysis of the results from which Table III. was constructed showed that there was a definite effect on birth-weight and growth-rate due to sex. The male lambs were significantly ($P < 0.01$) heavier at birth than the female. The magnitude of the difference, averaging treatments, was small, however, being 5 per cent. in 1942 and 7.5 per cent. in 1943. The male lambs also grew significantly ($P < .01$) faster than the female. The difference in this case was somewhat greater, being 8 per cent. in 1942 and 10 per cent. in 1943.

There was also a highly significant ($P < 0.01$) effect from the feeding treatment on birth-weight and growth-rate in both singles and twins. The increase in birth-weight of the single lambs from the "fed" ewes was 10 per cent. in 1942

and 18 per cent. in 1943. In actual weights this represented a mean increase of 1 lb. in 1942 and 1.6 lb. in 1943. The effect on the twin lambs was remarkable. In 1942 the twin lambs from the "fed" ewes averaged 2.6 lbs. heavier at birth than those from the control ewes. In both years it should be noted that the heavy prenatal feeding has resulted in the production of twin lambs as heavy at birth as the single lambs from the control ewes.

The effect of the feeding treatment on growth-rates, as revealed by the number of days taken to reach 65 lbs. live-weight, is also highly significant ($P < .01$) but the effect is smaller than that on birth-weight. The single lambs from the fed ewes grew 3.5 per cent. faster than the controls in 1942 and 4.2 per cent. in 1943. This represented an average decrease of four days in 1942 and five days in 1943. The effect on the twins is more marked especially in the latter year, when both the wether and ewe twin lambs from the "fed" ewes reached a live-weight of 65 lbs. almost three weeks quicker than the control twins.

The Influence of Birth-weight on Rate of Growth.

The number of days taken by the single lambs to reach 65 lbs. live-weight are grouped according to birth-weight in Table IV. The results for the two years 1942 and 1943 are so similar that they were combined for each birth-weight group.

Table IV.

Birth-Weight and Rate of Growth.

Single Lambs only (numbers in brackets).

Birth-Weight (lbs.).		Age at 65 lbs. live-weight.		Age at 65 lbs. live-weight.	
		Wethers.	Ewes.	Wethers.	Ewes.
		days.	days.	days.	days.
Below 8	Controls	98 (10)	107 (28)	98 (11)	107 (29)
	Feds	95 (1)	112 (1)		
8–9	Controls	93 (35)	104 (40)	94 (40)	103 (59)
	Feds	95 (5)	99 (19)		
9–10	Controls	88 (52)	95 (50)	89 (88)	96 (95)
	Feds	91 (36)	98 (45)		
10–11	Controls	85 (29)	90 (6)	86 (72)	92 (52)
	Feds	86 (43)	92 (46)		
11–12	Controls	81 (13)	86 (2)	82 (54)	90 (24)
	Feds	83 (41)	90 (22)		
Over 12	Controls	74 (1)	69 (1)	76 (22)	81 (10)
	Feds	76 (21)	82 (9)		

The importance of birth-weight in determining the rate of growth of both male and female lambs is very apparent. There is a steady increase in rate of growth with increase in birth-weight in the "fed" and the "control" lambs, with a difference of about three weeks in time taken to reach "maturity" between the heaviest and the lightest groups at birth. The regression coefficients were determined for each of the treatment-combinations and the effect of birth-weight on growth-rate was found to be highly significant in each year. For each 1 lb. increase in birth-weight there was found to be a decrease in time taken to reach 65 lbs. live-weight of 4.5 days in 1942 and five days in 1943.

No significant difference due to the feeding treatment was found in either year. In other words the lambs from the "fed" ewes have grown no faster than those *of the same birth-weight* from the control ewes. It is apparent that the

effect of the heavy prenatal feeding in increasing the growth-rate of the lambs can be wholly accounted for by the effect on birth-weight. This is surprising in view of the claims of Hammond (1932), Verges (1939) and Thomson and Fraser (1939), that prenatal feeding increases the milk yield of the ewes and of Ritzman (1917), Neidig and Iddings (1919), Hammond (1932 and 1940) and Bonsma (1939) that the early growth of the lamb is largely influenced by the milk yield of the mother.

The results for the twins are not included in Table IV. owing to the small numbers involved in the various birth-weight groups. Inspection of the data, however, reveals no obvious advantage in favour of those from the "fed" ewes, other than that due to their higher birth-weight. It would be expected that any effect on milk yield would be particularly noticeable with twins whose slower rate of growth compared with singles is believed to be due principally to the smaller amount of milk available per lamb. Support for this is provided by the fact that the few twin lambs reared as singles grew at about the same rate as the lambs of the same birth-weight born as singles and by the fact that the "fed" twins grew much more slowly than the "control" singles, although they were of similar average birth-weight.

It is also clear from Table IV. that the male lambs have grown faster than the females, independently of their heavier birth-weight. This contrasts with the results of Bonsma (1939) who found the significant difference in growth rate in favour of male lambs, compared with females, to be accounted for by the difference in birth-weight. On a basis of equal birth-weights the differences were found by this worker to be non-significant.

External Carcase Measurements.

A method of estimating carcase quality by means of a series of internal and external measurements has been used by Palsson (1939). A number of these external measurements and also the weight, length and minimum circumference of the left fore cannon-bone (efficient indices of the proportion of bone in the carcase) were used by the authors (Underwood and Shier, 1942) in their previous study on prenatal feeding and lamb growth. Similar measurements were made on an extended series of single and twin lambs from the 1942 experiment.

No good purpose would be served by detailing these results here. All the measurements taken were practically identical with those obtained from the single lambs in the previous year. No significant difference in conformation of carcase or proportion of bone, as revealed by these measurements, was obtained between the single lambs of the "fed" or the control groups; between the single or twin lambs in either groups; or between the twins of the "fed" and the twins of the control group, in spite of the significantly faster growth-rate of the former in each case. Apparently within the limits of time taken to reach a 65 lb. live-weight found in these experiments rate of growth is not an important factor in determining carcase quality.

Relation between Weight of Ewe and Birth-weight of Lamb.

The very large range in live-weight of the ewes raised the question of the relation of this weight to the birth-weight of the lamb. Accordingly, they were divided into 10 weight groups, each differing by 5 lbs., and the mean birth-weights of the male and female lambs from the "fed" and "control" ewes calculated for each of these weight groups. The results for 1942 and 1943 combined are presented in Table V.

TABLE V.

Ewe Weight and Birth-Weight of Lamb.*

Single Lambs only (numbers in brackets).

——	90–95.	96–100.	101–105.	106–110.	111–115.	116–120.	121–125.	126–130.	131–135.	136–145.
Fed—										
Wethers	10·1 (3)	10·2 (8)	10·5 (14)	11·3 (21)	10·5 (19)	11·1 (19)	10·6 (19)	10·8 (18)	11·1 (13)	10·8 (8)
Ewes	9·7 (6)	10·0 (7)	10·1 (17)	10·4 (12)	10·5 (23)	9·9 (25)	10·2 (16)	10·2 (16)	10·8 (10)	10·5 (10)
Control—										
Wethers	8·4 (6)	8·9 (10)	8·9 (11)	9·6 (10)	9·3 (11)	9·6 (23)	9·7 (29)	9·8 (16)	10·2 (10)	9·6 (16)
Ewes	8·0 (7)	8·2 (17)	9·2 (10)	8·8 (11)	8·6 (21)	9·6 (21)	9·2 (15)	9·0 (16)	8·6 (14)	8·5 (7)

* Ewe weights were taken as at 20th April, 1942, and 6th April, 1943, *prior* to the start of the differential feeding treatment and after several months under identical grazing conditions. The ewes had been 2–3 months pregnant on these dates.

The ewe weights were all taken at the commencement of the differential feeding treatment in each year. At this time the ewes (which were all mature animals aged 3½ to 5½ years) were 2-3 months pregnant and had all been under the same grazing conditions for several months. As a flock they can best be described as in "forward store" condition. It is realised that to a certain extent these live-weight differences can be ascribed to differences in degrees of fatness, but the numbers involved and the long period under the same nutritive conditions prior to weighing make it appear very unlikely that degree of fatness is a significant factor. The live-weights can therefore be taken as a reasonable index of the size of the ewe.

Inspection of Table V reveals that there is a tendency for the heavier ewes to produce very slightly heavier lambs. Statistical analysis of the data by the determination of the regression coefficients showed that there was no significant effect of ewe weight on lamb birth-weight *over the whole weight range,* for either the control ewe lambs or the fed ram lambs. In the case of the other two groups of lambs a significant effect was found but the mean increase in birth-weight was only 0.16 lb. for each 10 lb. increase in live-weight of the ewe.

Construction of a dot diagram indicated, however, that up to a ewe weight of between 105 and 110 lbs., there might be a more definite effect. Determinations of the regression coefficients from 90 to 110 lbs. ewe weights revealed a highly significant effect in three of the four lamb classes, i.e., the "fed" rams and the "control" rams and ewes. The mean increase in birth-weight of these three classes was 0.50, 0.63 and 0.85 respectively for each increase of 10 lb. in the weight of the ewe. For the heavier ewes, i.e., from 110 to 145 lbs. live-weight there was no significant effect for any of the four classes of lambs.

These results are not in conformity with those of Bonsma (1939) or Donald and McLean (1935). Bonsma found, with merino ewes mated to rams of a number of different breeds, a highly significant positive correlation between ewe weight and birth-weight of the lamb. The mean increase in birth-weight over a weight range of 55 to 120 lbs. of the ewes was very close to 0.72 lb. for every 10 lb. increase in live-weight of the ewes. Donald and McLean found, with a mixture of English Leicester ewes mated to rams of the same breed and Romney cross ewes mated to Southdown rams, about 1 lb. increase in lamb birth-weight for every 10-15 lbs. increase in ewe weight over a weight range of 65 to 160 lbs. It should be pointed out, however, that in the case of these latter workers, most of the ewes of smaller size were of an entirely different breed from those of larger size.

There are two other considerations which deserve mention before comparing our results with those of Bonsma and of Donald and McLean. Their ewe-weights were taken in both cases immediately following lambing and would therefore reflect nutritive conditions prior to lambing, themselves capable of influencing the birth-weight of the lamb, as our 1942 and 1943 experiments show. Also the lambs of these workers were all either first cross* or pure bred, whereas ours were all second cross lambs. A much higher degree of individual variation would be expected in such second cross lambs. Extreme individual variability in birth-weight and growth-rate of lambs, from ewes of the same weight or prenatal feeding treatment, was a striking characteristic of our data, necessitating the use of large numbers to reveal significant group differences. Individual variation of this nature points strongly to the influence of genetic factors in the experimental ewes, other than that indicated by their size, which affect the birth-weight (and growth-rate) of the lamb.

* Author's Note.—The N.Z. Romney cross ewes cannot be regarded as crossbreds in the true sense since although originally merino X Romney Marsh they have been repeatedly bred back to the Romney.

DISCUSSION.

Consideration of the results of the present experiments as a whole, together with those of the 1941 experiment, enables a clearer picture of the factors governing the production of high quality lambs to be painted, but still leave a number of important details to be filled in. In 1941 the "fed" ewes received only a very small supplement during late pregnancy and the only effect of the treatment was to produce a striking reduction in losses of ewes and lambs at or near lambing time, with no effect on birth-weight or growth-rate of the lambs. In 1942, and to a slightly smaller extent in 1943, the "fed" ewes were subjected to a much higher level of nutrition during late pregnancy and made considerable weight gains during this time. As would be expected there was once more a striking reduction in losses of ewes and lambs at or near lambing time. If this were the only effect of the heavier and more costly feeding treatment it is obvious that the only type of supplementary feeding which could be recommended from the practical point of view would be the smallest amount necessary to prevent such losses or reduce them to a minimum. From the results of the feeding of as little as ½ lb. of wheat per ewe per day for the last six weeks of pregnancy in 1941 it is apparent that the amount required must be very small and highly economic under average seasonal conditions in the export lamb producing areas in W.A.

However, the heavier prenatal feeding of the ewes in 1942 and 1943 produced, in addition, a significant increase in birth-weight of the lambs and a faster growth-rate, as measured by the number of days taken to reach a live-weight of 65 lbs. The effect on birth-weight of the single lambs was quite definite and highly significant in each year, but the effect on the twins was very marked. The mean birth-weight of the twin lambs from the "fed" ewes was actually raised to that of the single lambs from the control ewes. The significance of high birth-weight lies in the high positive correlation between birth-weight and rate of growth. This was found in the 1941 experiment and has been amply confirmed by the 1942 and 1943 experiments as shown in Table IV.

In 1941 each increase of 1 lb. in birth-weight reduced the time taken to reach a live-weight of 65-70 lbs. by about seven days on the average. In 1942 and 1943 the reduction, for each 1 lb. increase in birth-weight, was 4.5 and five days. As a result the singles from the "fed" ewes in 1942 reached "maturity" only four days earlier than the controls and in 1943 only five days earlier than the controls (see Table III.). This difference is so small that from this point of view very heavy prenatal feeding can hardly be justified. With the twins the reduction in time taken to reach "maturity" due to the feeding treatment was greater, especially in 1943, as would be expected from the greater effect on birth-weight, but the numbers of twins reaching 65 lbs. live-weight within a reasonable period, taking into account normal seasonal limitations, are ordinarily small in flocks of this type. Recommendations to feed heavily, based upon the probable improved performance of twins, would therefore seem to be unwarranted.

A point of considerable interest, apparent from Table IV., is that single lambs of the same birth-weight from the "fed" and the control groups have taken approximately the same time to reach 65 lbs. live-weight. In other words, the increased growth rate due to the prenatal feeding treatment, discussed in the previous paragraph, is entirely due to the increased birth-weight. This does not support the claims of other workers that raising the plane of nutrition of the ewe before lambing not only increases the weight and vigour of the lambs at birth, but produces an additional increase in growth-rate due to a stimulation of the milk yield of the mother. Examination of several of the ewes from the control group in the 1943 experiment indicated that these ewes had a very poor milk supply, at least

in the first 10 days of lactation, compared with the well fed ewes. If the very few examined were representative of the group as a whole, as seems most likely, then it is obvious that either the control ewes were able to overcome their early handicap with respect to lactation and later produce as much milk as the "fed" ewes, or the growth of the control lambs, under the conditions of these experiments, was not limited by the milk supply of the mother. Much more extensive milk yield studies, together with details of the growth of the lambs in the first few weeks of life, under high and low prenatal feeding treatments of the mother, are necessary to throw further light on this matter. Such studies are contemplated in the coming season.

A further important point to which attention was drawn in the published account of the 1941 experiment (Underwood and Shier, 1942), is the great variation in growth-rate of lambs of the same birth-weight in different seasons. It should be pointed out that these are of identical breeding, at least in the last three years' experiments, and in addition, all ewes and lambs from the day of lambing are run under apparently ideal nutritive conditions, i.e., they are grazed on ample quantities of young, green cereal crops, low in fibre and high in protein and other dietary essentials. Yet in 1941 the male and female lambs of 8-9 lbs. birth-weight took 118 and 130 days respectively to reach 65 lbs. live-weight, compared with 94 and 101 days for the lambs of the same birth-weight in 1942 and 92 and 102 days in 1943. And again in 1941 the male and female lambs of 10-11 lbs. birth-weight took 109 and 113 days respectively to reach maturity compared with 86 and 90 days in 1942 and 85 and 93 days in 1943. These seasonal differences are so large as to suggest that environmental conditions, other than nutrition, *after* lambing, as well as the level of nutrition *before* lambing, may be of extreme importance in determining the rate of growth of lambs. Temperature and the number of wet days immediately present themselves as of likely significance.

An indication that a succession of wet, cold days may exert a considerable influence on the growth of lambs was obtained in 1943. Thus on two occasions following a wet, cold period it was noticed that the weight gains of the lambs was smaller than during succeeding periods of fine, sunny weather. It seems reasonable to deduce from this that if the wet, cold weather had lasted much longer, as happens in some seasons, the overall rate of growth of the lambs would have been retarded and the length of time taken to reach 65 lbs. live-weight have approached more nearly that of the 1941 season. An analysis of the climatic conditions in a succession of seasons, for which lamb growth data are available, is being attempted and will be published with the results of next season's studies.

SUMMARY.

Experiments carried out at the Avondale Research Station, Beverley, with 340 Border Leicester x Merino ewes mated to Southdown rams in 1942, and 370 similar ewes in 1943, are described.

The ewes were divided into two even groups in both years. One group in each year (Control Group) was run on a restricted area of grazing during the last two months of pregnancy, so that the mean live-weight of the ewes was just maintained. During the same period in 1942 the other group (Fed Group) was grazed on ample young green barley so that a mean live-weight of increase of about 30 lbs. was produced. In 1943 the Fed Group received a supplement of ½ lb. wheat and ½ lbs. linseed nuts per ewe per day which produced a mean live-weight increase over the last two months of pregnancy of about 20 lbs.

It was found that the high levels of prenatal feeding brought about:—

(i) a highly significant reduction in losses of ewes from pregnancy toxaemia and of lambs at or near lambing time.

(ii) a highly significant increase in birth-weight and growth rate of both single and twin lambs. The effect on growth rate was much smaller than that on birth-weight;

(iii) no improvement in carcase weight or quality, as revealed by the grading returns and a number of external carcase measurements.

It was also found that:—

(i) the heavier lambs at birth grew significantly faster than the lighter. On the average each increase of 1 lb. in birth-weight of the singles reduced the time taken to reach 65 lbs. live-weight by 4.5-5 days;

(ii) the increased growth rate of the lambs from the fed groups could be wholly accounted for by the increase in birth-weight;

(iii) the male lambs were significantly heavier at birth than the female and grew faster, even when considered on the same birth-weight basis;

(iv) there was no relation between rate of growth and carcase weight or quality;

(v) up to about 110 lbs. live-weight the heavier ewes produced significantly heavier lambs at birth but above this weight there was no association between the weight of the ewe and the weight of the lamb.

The significance of these findings and those of the 1941 experiment is discussed and the conclusion reached that very high levels of prenatal feeding are unlikely to be economic, since the increase in growth-rate from such treatment is not, on the present evidence, very great and the losses of ewes and lambs can be equally prevented by a small supplement of grain.

Attention is drawn to the great variation in growth-rate of lambs in different seasons and the suggestion made that climatic conditions after lambing may have a marked effect on lamb growth.

ACKNOWLEDGMENTS.

Grateful acknowledgment is made to the management of the W.A. Meat Export Coy. for their co-operation; to Messrs. N. McKeown, D. H. Curnow and W. Human, of the Department of Agriculture, for their assistance at various stages of the investigation; and to Mr. R. C. Rossiter, of the C.S. & I.R., for great help with the statistical analysis of the data.

REFERENCES.

Bonsma, F. N. (1939): *Univ. Pretoria, Sth. Afr. Public Series I.: Agric.* 48.
Donald, H. P. and McLean, J. W. (1935): *N.S. Jn. Sci. & Tech.* 17 : 497.
Hammond, J. (1932): "Growth & Development of Mutton Qualities in Sheep."
Hammond, J. (1940): "Farm Animals: Their Breeding, Growth and Inheritance."
Neidig, R. E. and Iddings, E. J. (1919): *Jn. Agric. Res.* 17 : 19.
Pálsson, H. (1939 and 1940): *Jn. Agric. Sci.*, 29 : 544 and 30 : 1.
Ritzman, E. G. (1917): *Jn. Agric. Res.* 8 : 29.
Thompson, W. and Fraser, A. H. H. (1939): *Scottish Jn. Agric.*, 22 : 71.
Underwood, E. J. and Shier, F. L. (1942): *Jn. Dept. Agric., W.A.*, 19 : 37.
Verges, J. B. (1939): Suffolk Sheep Soc., Yr. Bk., 1939.

Black Rot of Cabbage, Cauliflower and Related Plants.

W. P. Cass Smith, Plant Pathologist.

Black rot is a common and serious disease which has been recorded from practically all countries where crucifers are grown. The disease is most prevalent here on cabbage and cauliflower, but it may also affect other plants belonging to the family *Cruciferae* including—brussel sprout, broccoli, kohlrabi, turnip, swede, radish, flowering stock, and a number of weeds, such as mustard and wild radish. During the winter months, black rot is usually of little consequence, but during warm wet weather it may be extremely destructive, especially when it becomes established early during the growing season.

Plate 1.

Cabbage leaf showing symptoms of black rot.
Infection generally occurs through waterpores at the leaf margin, but it may also take place through wounds made by biting insects. After infection the organism advances through the vascular strands into the leaf stalk and main stem, and the invaded tissues are blackened and killed. Note blackening of small affected leaf veins, and of the vascular strands in the leaf stalk. (See cross-section relatively enlarged.)

In March, April and May, 1943, weather conditions were extremely favourable for the development of the disease and outbreaks occurred in cabbage crops in several districts, including Osborne Park, Spearwood, Balcatta and Wanneroo. Serious losses were caused on this occasion, which in some cases amounted to total crop failure. These outbreaks were largely attributed to the planting of contaminated seed and there is no doubt that by paying more attention to relatively simple control measures, growers could to a great extent have prevented such disastrous losses.

CAUSE.

Black rot is a bacterial disease caused by *Bacterium campestre* (Pam.) E.F.S. These minute bacterial organisms are generally introduced into new areas with seed which has been harvested from diseased plants, and to a lesser extent by introduced seedlings, or animal manures or composts, containing diseased plant remains. Once the disease is established, the bacteria are spread about chiefly by spattering rain or water from sprinklers, biting insects, and surface wash. They are able to swim freely in water and if they lodge near the waterpores on the leaf margins where water collects, or on insect injuries where sap exudes, they cause infection. After infection they invade the plant tissue until the veins are reached and their further progress is mainly confined to the water conducting strands in which they rapidly multiply and spread.

SYMPTOMS.

Plants may be affected with the disease at any stage of growth. Usually the first obvious sign of the disease is the blackening of some of the smaller veins at the leaf margin, and later the affected leaf tissues become brown and wilted. Similar symptoms may also be seen in the neighbourhood of wounds caused by biting insects. The further progress of the disease is inward and downward to the stem through the water-conducting strands and it can usually be traced in the smaller veins by their black discolouration. In the thick leaf stalks and main stem however, this symptom is generally visible only on cross-sectioning

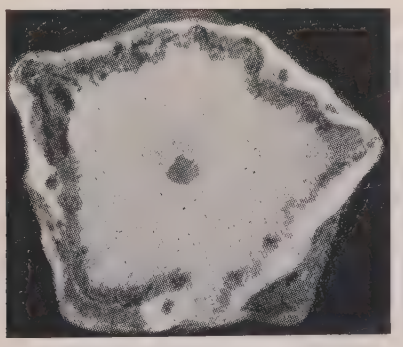


Plate 2.
Cross section of cauliflower stem showing typical black rot invasion. After Shropshire and Kadow.

(Plates 1 and 2). Once the main stem is invaded the organism progresses up or down, subsequently invading younger or older leaves, which yellow and drop prematurely. Plants infected at an early stage frequently make "one sided" growth (Plate 3) or are dwarfed and heading is sometimes prevented. Affected leaves soon drop and badly diseased plants often have a long bare stalk with a small head or

tuft of leaves at the top. Black rot alone does not cause a soft rot, but frequently secondary soft rot bacteria enter the invaded tissues causing a slimy head decay and stump rot.

Except in the case of turnip, swede and radish, the disease is confined to the above ground parts. However, the storage organs of these and similar crucifers with fleshy roots may be affected below ground with a dry rot, and this is frequently followed by soft rot (Walker, 1938).

CONTRIBUTING CONDITIONS.

The disease is generally initiated either from black rot bacteria introduced with the seed or present in the soil. Some affected seedlings may be killed outright, but others survive and from these the disease is primarily spread to other healthy plants.

In transplanted crops such as cabbage and cauliflower, black rot usually commences in the seed-bed where plants are crowded, and here an early spread of the disease is greatly favoured. Splashing water from sprinklers, or rain, is probably the most important means of dissemination for it has been shown (Walker, 1934) that in seed-beds protected from rain and watered by furrow irrigation, the spread of black rot is checked very considerably. During our warm dry summer months, sprinklers are commonly used to water cabbage or cauliflower seed-beds and thus ideal conditions are provided for the spread of the disease.

Plate 3.
Cabbage plant showing "one sided" growth resulting from invasion of the stem on one side only, at an early stage.

The duration of the seed-bed period may thus be a matter of importance also, unless precautions are taken, because the longer the plants remain in the beds before they are transplanted the greater is the liability to widespread infection. For economy of labour and also to obtain a hardy type of seedling which transplants well, growers sometimes retain cabbage seed-beds for lengthy periods in summer to provide seedlings for two or more plantings. Quite apart from the

doubtful advantages of this practice, it has been noticed in these circumstances, that whereas the first crop contained few diseased plants, later crops and any plants remaining in the seed-bed were often badly diseased.

In the seed-bed, symptoms of black rot often escape notice for infected lower leaves usually drop off. However, such plants are affected internally when transplanted, and subsequently when they develop typical symptoms in the field, growers generally believe the outbreak is of recent origin.

The severity of the disease in the field and the time taken for symptoms to appear after transplanting varies considerably. During warm wet periods when plants are turgid and making vigorous growth the disease progresses rapidly, and secondary infections are more numerous, but with less favourable conditions the development of the disease is slower and its extent is lessened.

At the present time when insecticides are often in short supply, biting insects are probably more prevalent than usual. Insects of this kind transmit the black rot bacteria and also cause injuries through which infection may take place (Plate 4), and so the disease may reasonably be expected to increase above its normal amount, unless adequate steps are taken to prevent its occurrence.

Plate 4.
Biting insects transmit black rot bacteria, and also cause injuries through which infection may take place. Note insect wound in the black rot-affected area of this cabbage seedling leaf.

Attention to hygiene is also very necessary. All too frequently diseased plants are left lying in the field or seed-bed or they are dumped on the manure heap to rot. The organism may be carried over from year to year by diseased plant refuse and its disposal either by fire, or deep burial, in land which will not be cropped to crucifers for two to three years, is obviously important.

Continuous cropping of the land with crucifers will in the long run prove very bad economy, for this practice encourages other parasites in addition to black rot.

CONTROL.

1. Unless the seed is known to be disease-free it should be disinfected before planting with the hot water treatment.* This measure is especially important during war time when seed of unknown origin must often be used.

2. Locate the seed-bed well away from the area in which the transplants will be set, either on new soil, or on land which has not grown cruciferous crops for several years.

If any doubt exists as to the freedom of the ground from disease, sterilise the soil with formalin.† Eradicate weed hosts such as mustard, wild radish, etc., from the vicinity.

3. Since water from overhead sprinklers disseminates the causal organism, avoid wetting the foliage in the seed-bed, either by planting on moist soil, or by furrow irrigation between the rows.

4. Adopt a rotation so that cruciferous crops are only grown once every two to three years on the same ground.

5. Eliminate biting insects as much as possible by the use of appropriate insecticides, and pay strict attention to hygiene practices.

* HOT WATER TREATMENT.

To disinfect cruciferous seeds from black rot, and incidentally from black leg also, immerse the seed in hot water (122° F.) for 25 minutes for cabbage and 15 minutes for others. To ensure uniform temperature conditions during the steep, a large volume of water in proportion to seed should be used, e.g., ¼ to ½ lb. per four gallons. A suitable container, such as a kerosene tin fitted with a lid in which two holes have been bored, is nearly filled with water at the required temperature and well insulated with straw, chaff or bran, etc., either in a box, or hole in the ground. The seed, tied loosely in a cheesecloth or muslin bag, is then suspended in the hot water and the tie passed through a hole in the lid. Through the other hole, an accurate Fahrenheit thermometer is inserted. During treatment the seed should be well agitated, but care should be taken to avoid wetting the insulating material. Boiling water should also be on hand to maintain the temperature as required. After treatment dry the seed as rapidly as possible by spreading it out thinly in the shade and stir it to promote air circulation. The reduction in germinable capacity of good quality seed is small when the hot water treatment is carefully applied according to directions. Weak seed should not be treated, therefore, if the quality is doubtful, a trial sample should first be tested.

† SOIL STERILISATION WITH FORMALIN.

To sterilise soil with formalin make up a 2 per cent. solution by adding one gallon of commercial formalin to 49 gallons of water. This solution is applied with a watering can to the soil, which should previously have been well loosened up, at the rate of about one-half to one and one-half gallons of the solution to the square foot. The heavier the soil, the more needs to be used. The treated soil is then smoothed down and covered with bags moistened with the formalin solution, and left for several days. Forty-eight hours is usually enough, but no harm will be done if the covers are left on for a longer period. The bags are then removed and the soil thoroughly stirred with implements previously sterilised in steam, fire, boiling water, or formalin so as to let out the fumes. The stirring process should be repeated several times during the next ten days or a fortnight, after which the seeds may be safely sown. This treatment has been used many times in this State with great success.

LITERATURE.

Walker, J. C.: Production of cabbage seed free from *Phoma lingam* and *Bacterium campestre*. Phytopath. 24; 158-160, 1934.

——— Diseases of cabbage and related plants. U.S. Dept. Agr. Bul., No. 1439, 1938.

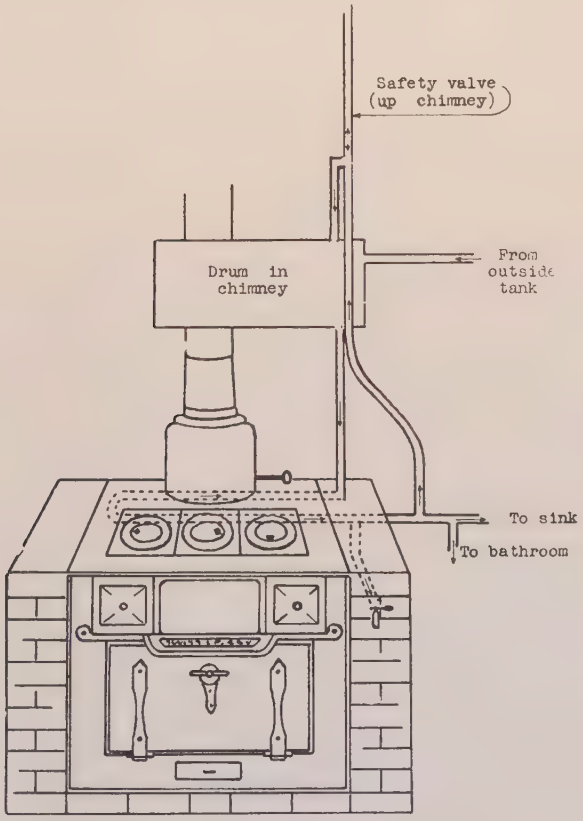
Hot Water Unit for Country Homes.

F. V. KNAPP, Agricultural Adviser.

There is a considerable demand for hot water in country homes, for besides washing up, baths, etc., hot water is required for the washing and scalding of milking utensils and separator parts and in general insufficient water is provided by kettles and saucepans for the proper cleansing of such items. Most farm kitchens have a fire burning for the greater part of the day and the following unit, as designed and installed by Mr. E. Chester of Cleary, can be installed in such kitchens with very little expense or labour.

Requirements.

(a) A 100-gallon tank mounted on a stand at least twelve feet high.
(b) A drum of approximately 12-gallon capacity (a petrol drum serves well).
(c) Piping (galvanised or black) ¾in. or 1in. diameter. Length will depend on conditions.



Procedure.

The tank is placed on a stand (either in the ceiling of the home or adjacent to the house) and if a water scheme is available, the filling is controlled by a ball cock, whilst where no scheme is available the water must be pumped into the tank, and in such cases the head of water may also be used for a bathroom shower. Care should be taken that the tank does not become empty.

The drum is placed either horizontally or vertically in the chimney of the kitchen fireplace, just above the mantelpiece where it will be out of sight; arrangements should be made so that the drum can be easily removed, if necessary.

The piping is connected as follows (see diagram) :—One pipe from the bottom of the outside tank to the centre of the drum. A second pipe from the bottom of the drum in through the side of the firebox of the stove (remove a few bricks from the hob and the side of the firebox can easily be cut, as it is usually only 16-gauge iron) across the firebox (near the back) and out again through the same side. In stoves with a large firebox, the pipe may go around the firebox or across it a couple of times to give greater heating surface. It is preferable to have one continuous piece of pipe in the fire-box, but jointed bends will serve. After leaving the firebox the pipe is divided into four by means of sockets—one of these goes to a tap in the hob, another to the kitchen sink, the third to the bathroom, whilst the fourth returns to the top of the drum and then continues on up the chimney, to a height above the level in the tank, to act as a safety valve.

All sockets in contact with the hot water should be soldered to prevent leaking and after prolonged use the washer in the tap in the hob will need replacing.

Galvanised or black piping in the firebox gives very good service although copper piping, if procurable, would be more suitable.

The bathroom should not be too far away from the kitchen as the water cools off somewhat whilst travelling the distance. However this can be overcome to a large extent by lagging with asbestos rope.

Such a system supplies boiling water at the hob and very hot water at the kitchen sink, in quantity, so long as the fire is alight and not too great a drain is made on it. The water in the drum remains hot for a long period after the fire is out and this period can be increased by suitable insulation of the drum and pipes.

Thanks are due to Mr. Chester for the explanation of the scheme and permission to publish it.

Vitamin A and other Vitamins in the Nutrition of Farm Animals.

E. J. Underwood, Animal Nutrition Officer.

It is now generally realised that a large array of chemical compounds are present in all foods. Many of these are necessary in the diet of animals, in amounts ranging from the great to the infinitely small, if proper growth and health is to be maintained. These necessary compounds can be conveniently classed into a number of groups as follows:—

The Fats and Carbohydrates.—(Fats, sugars, starches and "fibre") which are the main source of fuel or energy for body movements, growth and work.

The Proteins.—(Complex nitrogen containing compounds) which supply the structural materials for body growth, and repair.

The Minerals.—(Lime, phosphorus, magnesium, iron, copper, cobalt, etc.) necessary for the development of the bones and teeth and the blood and certain other essential body functions.

The Vitamins, or "Accessory Food Factors" necessary in minute amounts for the proper utilisation by the animal of the other food constituents and the maintenance of normal, healthy "metabolism" or general bodily processes.

More than a dozen of these vitamins have now been shown by scientists to have different functions in the animal organism. It should be clearly recognised that they are chemical compounds just like sugar or salt or starch, and are just as necessary in the food. The difference between the vitamins and the other "major" constituents of food is that the former function in much smaller quantities, and their mode of action in the body is not yet so clearly understood. The *principal* vitamins may be listed as follows:—

Vitamin A (including carotene) for growth, resistance to infection, health of the eyes, fertility, egg production and hatchability.

*Vitamin B*1 (thiamin) for growth, good appetite, healthy nervous system, and proper use of sugars and starches.

Vitamin B Complex (including riboflavin vit. B2.)—(there are a number under this heading)—for growth, healthy skin, eyes and mouth; for egg production and hatchability of eggs.

Vitamin C (ascorbic acid) for healthy teeth, gums and blood vessels.

Vitamin D, the sunshine vitamin, for growth and proper development of bones and teeth.

The Different Vitamin Requirements of Different Types of Animals.

At one time it was believed that the vitamins were only important in the nutrition of human beings and of small laboratory animals, such as rats and guinea pigs. It is true that in general they are more important for these species than for most farm animals kept under ordinary practical conditions. It is equally true, however, that under certain conditions vitamins may be of very great practical significance for farm animals. There are considerable differences between different species of animals in this respect. Thus pigs and poultry have high requirements for the members of the vitamin "B" complex, as well as for the other vitamins. Most of the members of the vitamin B complex are liberally supplied in the whole cereal grains, and particularly their by-products bran and pollard, which together generally make up the main part of pig and poultry rations.

In the case of sheep and cattle, on the other hand, the members of the vitamin B complex and vitamin C, are of no practical significance. This does not mean they do not need these important compounds. It means that under all practical feed conditions they are capable of manufacturing their own supplies by means of the vast numbers of bacteria and other micro-organisms in their capacious rumen or "paunch." This is a fortunate fact for farmers who have no worries with their sheep and cattle in this respect. The fat-soluble vitamins, i.e., vitamins A and D are, however, required by all species, and of the several members of this group vitamin A is likely to be easily the most important under ordinary farm conditions.

Riboflavin.—In contradistinction to the other members of the vitamin B complex, vitamin B2, or riboflavin is not very high in cereal feeds or in meatmeal. It is, however, present in considerable amounts in skim milk and butter milk, in greenstuffs and in liver meal. Riboflavin deficiency results in poor growth and even death in chicks and a typical "curled toe paralysis," which forces them to walk on their hocks with their toes curled inwards. In hens the deficiency reduces egg production, and results in a lower hatchability of the eggs, which are pro-

duced. It is therefore essential to see that growing chicks and laying hens are given regular and ample supplies of greenstuffs, or have small amounts of dried skim milk, or butter milk, or liver meal in their ration.

Vitamin D.—This vitamin is required for the proper absorption and utilisation of the minerals, lime and phosphorus in the production of sound teeth and bones. It is sometimes called the "sunshine vitamin" because it is formed in the skin of animals by the action of sunlight, and ultra violet rays. In those parts of the world where the winter is long and hard, and animals have to be housed for considerable periods special provision has to be made to supply extra amounts of this vitamin in the feed. Under our climatic conditions, however, there is no evidence as yet, that extra vitamin D is necessary at any time. A possible exception is the case of "battery-reared" chicks, in which small amounts of a suitable fish liver oil preparation rich in vitamin D might profitably be incorporated in the mash.

The Functions of Vitamin A or Carotene.

This vitamin, or carotene, which is readily converted into vitamin A in the animal body, is essential for growth of all animals. It is sometimes called the "anti-infective vitamin" because, under conditions of deficient intake, animals develop a great susceptibility to infections of the eye and of the respiratory, urinary and reproductive tracts. It appears that vitamin A is required to maintain normal healthy membranes in these parts of the body. Besides the infective condition of the eyes known as xerophthalmia, night-blindness, or inability to see well in dim light, also occurs in animals kept for some time on a diet even mildly deficient in vitamin A. In some species urinary "stones" or calculi develop as a result of deficiency and it may be that this is related to the occurrence of such calculi in sheep in some of the drier parts of the agricultural areas of W.A.

Vitamin A and Fertility in Animals.

The influence of vitamin A in maintaining healthy reproductive organs and membranes makes it of special importance in the fertility of farm animals. Research has shown that breeding animals need about three times as much vitamin A and five times as much carotene in their diet as non-breeding animals. The existence of reproductive troubles due to vitamin A deficiency under natural grazing conditions has been demonstrated in California towards the end of a long (6-9 months) dry-feed period. Calves were either born dead or very weak and often had severe diarrhoea. Ewes kept under vitamin A deficient conditions before and after mating conceived normally, but all the lambs were born dead or died within 24 hours. A diet of low vitamin A potency has been recently shown in N.S.W. markedly to reduce sperm production, and hence to lower fertility in the ram. Changing over to a diet of high vitamin A potency, i.e., containing plenty of green grass, or well cured lucerne or clover, hay or carrots or codliver oil, quickly resulted in a regeneration of sperm production.

Liver Reserves of Vitamin A.

All animal species and birds have the ability to store up, during periods of high intake, considerable reserves of vitamin A in their livers, and to a lesser extent in other parts of the body, which can be drawn upon during periods of low intake in the diet, or when specially large amounts are required for any purpose. This is of great practical importance, because it means that animals do not have to have foods rich in vitamin A all the time. For periods, varying in length with

the magnitude of the reserves previously built up, and with the extent of the deficiency at the time, they can get along, without any ill-effects, on a diet containing less than the minimum requirements of vitamin A or carotene.

In studies carried out in England it was shown that the ordinary cereal rations fed to pigs are very deficient in vitamin A, unless supplemented with some greenstuff or special fish oil preparation. If, however, the sow before and after farrowing, and the piglets from birth to weaning are provided with a ration amply supplemented with either the greenstuff or the fish oil, sufficient reserves of vitamin A are built up in the livers of the weaners to last them a further 4-5 months, i.e., up to six to seven months of age, without any ill effects even in the absence of any further supplements. After this time the reserves become dangerously low and loss of appetite followed by a paralysis of the hind limbs occurs.

In W.A. it was recently demonstrated that wethers and dry ewes, under the grazing conditions of the central districts of the agricultural areas, have very high reserves of vitamin A in their livers during the green feed period of the year (May to October). Thereafter depletion of these reserves takes place, but generally low values do not occur generally until late summer (March and April). A rapid rise in reserves then takes place with the advent of green feed in the next autumn. In ordinary summers it is very probable that the reserves built up during the winter and spring will be sufficient to carry wethers and dry ewes through without any evidence of deficiency, and the same remarks should apply to non-breeding and dry cattle grazing under the same conditions. With breeding stock, however, or with any grazing stock in exceptionally long, dry summers, as occurred in 1940, it is probable that vitamin A deficiency will affect health and reduce breeding efficiency. Sheep owners have long been familiar with the fact that satisfactory lambings generally follow a season of early opening rains, whereas late opening seasons, i.e., long, dry summers, are often followed by poorer lambings, with occasionally severe losses from abortions and lambs born dead. Undoubtedly, this is due largely to the general low level of nutrition of the ewes during such seasons, but specific vitamin A deficiency is probably a contributing factor. Suitable supplementary feeding of lambing ewes thus becomes essential during the late summer months if the chance of vitamin A deficiency is to be entirely eliminated.

Carotene Content of Pastures.

An examination of samples of representative pasture species from three different centres in the southern agricultural areas of W.A., disclosed the fact that their carotene content remained very high throughout the main growing period. As they matured and dried off, however, the carotene content fell rapidly at each centre, and by early November all the annual species studied were sufficiently low to make it necessary for grazing sheep and cattle to begin drawing upon their liver reserves of vitamin A. Throughout the rest of the summer it is reasonable to assume that the pastures were still more deficient. The legumes studied (subtennanean clover and burr trefoil) were higher than the grasses and other species and tended to retain their carotene longer into the important spring period. A pasture high in clovers would, therefore enable grazing animals to start off the summer with higher liver reserves and postpone slightly the time when they would have to start drawing upon them. In the same way a fairly productive later maturing grass such as Wimmera rye grass was found to maintain its carotene content slightly longer than a relatively poor early maturing grass, such as barley grass. A pasture containing a proportion of Wimmera rye grass to replace some of the poor grasses, would not only be improved in productivity and general composition, but would also be a better source of vitamin A. Pasture improvement

in general can therefore be expected to help the position of grazing stock in respect to vitamin supplies, but not to solve it. Where the summer is long, hot and dry, and no green picking is available the grazing will always be deficient in carotene. For non-breeding animals in summers of ordinary length this is probably not important, as pointed out earlier, because of the liver reserves, but for breeding animals it may be so, and knowledge of the value of the various supplements as a source of vitamin A becomes necessary.

Carotene Content of Fodders and Grains.

The chief summer supplements for sheep and cattle in this State are wheaten and oaten hay, clover and oaten silage, "meadow" or clover hay, and wheat, oats and barley grain.

The grains were all found to be consistently very low in carotene. Such materials can, therefore be regarded as poor supplements from the point of view of vitamin A, although they are very good sources of available energy, and also fair sources of protein, compared with the protein content of average dry summer grazing.

Of the other materials examined both oaten and clover silage were found to be easily the best sources of carotene and these fodders can be regarded as good vitamin A supplements to summer grazing. The hays were found to be exceedingly variable, but the "average" clover hay is usually appreciably higher in carotene than "average" oaten hay, and oaten hay higher than wheaten. Too much significance should not be attached to any difference between wheat and oaten hay in this connection, however, because of the great range of values found for each. Both the stage of maturity at hay-cutting time, the curing conditions in the field, and the length of storage have a profound influence on carotene content. In general it can be stated that any conditions which maintain a good green colour in hay, whether it be oaten or wheaten, will also result in a relatively good carotene content. "Prime" chaff of good colour was always found to be higher in carotene than chaff of a paler colour classed as medium or poor quality.

Vitamin A and Poultry Nutrition.

Reference has been made earlier to the fact that ordinary cereal plus meat-meat rations for poultry (and to a lesser extent for pigs) are likely to be deficient in riboflavin (vitamin B2), unless supplemented with green feed, skim milk or butter milk or liver meal. A deficiency of vitamin A is even more likely to occur with such rations unless plentiful amounts of green feed are supplied or small quantities of a reputable brand of cod liver oil, shark oil, or some similar preparation given at regular intervals.

On cereal rations without one of these supplements symptoms of deficiency will show up as soon as the body stores or reserves of vitamin A are used up. This may be within a month of dropping the green feed, or other source of vitamin A from the ration. Chicks and laying hens are particularly susceptible, but all birds will show signs of deficiency unless properly fed. The symptoms have been described in a previous journal article (Mahaffey, L. W., J. Department of Agric., W.A., March, 1941). Egg laying begins to drop off, the birds lose condition and their general resistance to many diseases is lowered. The hatchability of the eggs which are laid is also lowered. A condition develops known as "nutritional roup" characterised by whitish, cheesy deposits in the mouth and cavities of the head, watery "bung" eyes and difficult breathing.

All this can be prevented by feeding adequate green feed all the year round. About 7lb. per 100 hens per day can be regarded as near the minimum. Where

green feed is unavailable, or in short supply the vitamin A requirements can be equally well provided by incorporating, as suggested earlier, a good brand of fish liver oil ("poultry grade") into the mash at a level of about 2-4 tablespoons per 100 lb. of mash. It is essential to note that these oils lose their potency readily on exposure to light, or when mixed with cereal meals. They should be stored in a cool, dark place, and mixed in the mash as frequently as possible, or at not more than weekly intervals. Larger quantities of oil than those suggested will give no additional benefit, and will represent a waste of valuable oil and money.

GENERAL SUMMARY AND RECOMMENDATIONS.

A large number of accessory food factors or vitamins are now known to be necessary in small quantities for farm animals. Many of these are of little practical importance, particularly in the case of sheep and cattle.

Care is necessary to avoid trouble from deficiency of vitamin A in all species of animals under prolonged dry-feed conditions, and from an additional deficiency of vitamin B2 (riboflavin) in the case of poultry and pigs.

Vitamin A is required for growth, for resistance to various infections and for fertility in both male and female. Green feed is the best and cheapest source.

Conserved feeding stuffs can be ranged on an average in the following descending order of importance as a source of vitamin A:—Silage, clover or "meadow" hay, oaten hay, wheaten hay. Cereal grains are very poor sources.

The vitamin A potency of hays is highly dependent upon earliness of cutting and conditions of curing. Greenness of colour in hay is an excellent indication of relatively high vitamin A potency.

In the absence of green feed for more than very short periods growing chicks, laying hens, breeding sows and piglets up to weaning should receive regular small quantities of cod liver oil or other potent fish liver oil as a vitamin A supplement.

Cereal grain and meat meal rations are deficient in riboflavin for poultry and to a lesser extent pigs unless supplemented with either green feed, skim milk, buttermilk or liver meal.

An Electric Bird Scarer.

A NEW USE FOR THE ELECTRIC FENCE.

T. C. Miller, Horticultural Adviser.

A matter causing great concern to orchardists over the whole of the fruit growing areas of this State is the depredation of crops by birds. During recent years the number of these pests invading orchards has increased enormously, particularly in the apple growing districts where "white" tailed black cockatoos, king parrots and twenty-eight parrots have done most damage. The writer can recall one occasion while performing an orchard inspection at Manjimup when a flock of about twenty black cockatoos slipped quietly into one end of an orchard and when disturbed less than ten minutes later had destroyed what was conservatively estimated at forty cases of Democrat apples. Most growers can recall similar incidents, but it may be mentioned that a Donnybrook orchardist who had an official estimate of 1,000 cases of Cleos did not pick a case of this variety, due entirely to the ruining of the crop by this same destructive species.

Normally the method of combating these bird pests has been with patient watching, a good gun and plenty of ammunition, but wartime conditions and the subsequent shortage of labour and ammunition, have made it almost impossible to protect fruit crops satisfactorily in this way.

Many contraptions calculated to act as scares have been devised, a lot of them ingenious, and most of them weird, such as hanging mirrors which flash in the sunshine, and suspended bright kerosene tins which glare in the sun and clang together with the breeze, all of which have effect for a period until the birds become accustomed to them.

A patented American invention consisting of an acetylene generator, a pilot light and an explosion chamber fitted with a trap door, has possibilities. The acetylene gas is evolved by the action of water dripping on calcium carbide in the generator. It diffuses through the chamber, forming an explosive mixture with the air inside, and when this contacts the pilot light through a jet, a loud explosion occurs. The trap door acts as a safety valve, and the action is continuous and automatic. Up to the present the mechanical difficulties of this contrivance have not been solved in this State, but there is scope for a handy man to build one as the idea appears to be sound, and should be effective.

The possibility of adapting the electric fence to act as a bird scarer was first put to practical test by Mr. R. A. Andrews of Redmond, who reported very optimistically concerning the effectiveness of his trials. Consequently an experiment was carried out on an orchard at Karragullen to determine the efficacy of the electric fence as a scarer for birds, and to find the practical difficulties which would be experienced in erecting a suitable device. Mr. A. J. Davies, whose apple crop was severely damaged by birds the previous harvest, willingly co-operated in providing materials and labour for the construction of an experimental fence on his property, and Westralian Farmers, Ltd., kindly made available an electric fencer unit and battery. The Fruit Growing Industry Trust Fund Committee supplied insulators and various electrical fittings for the purpose of ascertaining which types were the most suitable in the construction.

The Stronghold electric fencer unit supplied is a very compact and efficient one, run by an ordinary 6-volt battery, and being capable of electrifying up to twenty miles of wire. All safety precautions are incorporated and it is particularly easy to set up and adjust.

CONSTRUCTION.

The general principle is to have the main wires from the battery and unit running along the side of the orchard, and wires to be electrified along each row of trees at right angles to the mains.

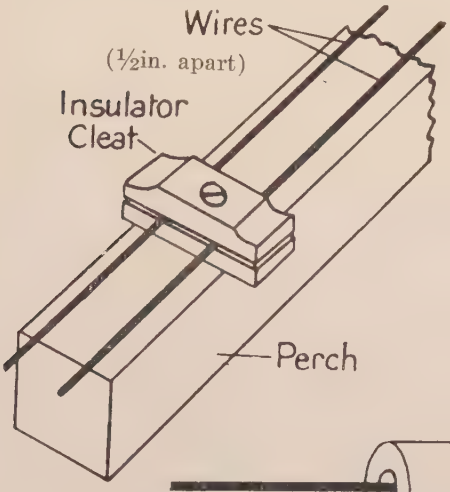
It is necessary to have a metallic earth, which is best supplied by a wire parallel and close to the live one, and so arranged that birds alighting on the perches provided will make contact with both wires.

Ordinary fencing wire can be used throughout the system and it is advisable to choose light gauge soft iron wire to give ease in manipulation.

The two wires are run along the existing orchard fence posts using button insulators, or alternatively, posts of any convenient height may be used to carry them. In the case of the Stronghold fencer both main wires lead from the unit, but with some other types the positive terminal of the battery is connected with the fencer, and the negative to the earth wire. The live wire only, then runs from another terminal on the unit. No connection is made between the two mains, each

running to an insulator at the end of the orchard fence, and neither may be earthed.

The mains are attached securely to their respective terminals, and when the battery is connected with the fencer unit, the wires become charged. Due to the comparatively high potential of the current, there will be an appreciable loss in voltage if all joins right throughout are not well made, by either soldering or using strip bakelite connectors.



Method of attaching wires to perches.

Tube insulator to keep parallel wires apart.

ERECTION OF WIRES ALONG THE ROWS.

In the experiment performed at Karragullen, the two lengths of wire were run parallel, half an inch apart, over the top of a row of Yates trees—this row being selected as it was adjacent to uncleared forest land, and had suffered extensive destruction of its crop by parrots in the previous season. Where maypoles are erected at the centres of the trees, these would be ideal for supporting the wire, but in the experiment these not being available, a stout sapling was put alongside every second tree in the row. The saplings at the ends of the row were made firm with guy ropes, and the wires attached to them by means of egg insulators, as is usually done with an ordinary wireless aerial, and then strained as tightly as possible. The wires must not touch each other at either end or at any point along their length. If the fencing wire is not too heavy and can be strained well, there is little fear that they will touch, but it is safest to slip a number of tube insulators at intervals on one wire, as if they approach much under half an inch the current jumps across the gap and shorts the circuit.

On the top of each post or maypole is fixed a perch of 2in. x 1in. timber about five feet in length, running along the same direction as the parallel wires, and to these the wires are fixed by means of tubes or cleat insulators. The perches have the purpose of supporting the wires and providing a rest for birds. When the two wires are in position they are connected, one to each of the mains. Any number of pairs of parallel wires running along the rows can be connected to the mains at the end of the row, the limit being as mentioned above, twenty miles of wire.

The intention is that any bird settling on a perch will contact both wires and receive the severe shock delivered from the current produced by the fencer unit. The shock is not sufficient to kill ordinary birds, but has the same reaction as with stock, and any birds which make the contact will not approach that portion of the orchard again.

It is considered advisable to have the electrified wires running over the tops of the trees, but where the trees are vigorous and make several feet of growth during the season, it would be better to run the wires alongside the trees and level with the top layer of fruit.

While the system is in operation it is essential to make periodic inspections as there is a tendency for the current to jump across the shortest gap between the wires, and if at any place they come close together, due to a kink or a join in one of them, there is a big risk of shorting, and while contacting both wires under this condition still gives a considerable shock, the battery is being unnecessarily run down. It is interesting to note that during a period of three months the battery used—a small six volt—was recharged once only.

Section of fence showing: (1) Perch on top of post; (2) A perch suspended from wires in between trees.

RESULT.

It is a strange fact that, early in the season, considerable damage was done by smaller parrots to the immature fruit on the trees, but as the season progressed the number of birds troubling orchardists in general, decreased considerably, and little concern about this pest was experienced on this particular orchard where the experiment was conducted. This was very satisfactory to growers but not for the sake of the experiment, and consequently the usefulness of the construction as a bird scarer could not be definitely estimated. It is of interest to observe, however, that the wires and perches attracted quite a number of smaller birds which frequented the orchard, and they settled on it readily, but were not large enough to make the connection between the two electrified wires. From this it appears that the high perches and wires possess a certain attraction for birds, and it is considered that if a sufficient proportion of the destructive species receives a shock, it will cause them all to be afraid of the protected portions of the orchard.

CONCLUSION.

Providing the height of the trees does not require the wires to be fixed too high above the ground, and so long as satisfactory light gauge wire is available, the

labour and cost involved are not considerable, and once the posts are up and the perches made, the apparatus is permanent. Until, however, the idea can be given a fair trial in a season when the pest is bad, the electric fence as a bird scarer cannot readily be recommended, but from information gained and observations made last season, there is every reason to hope that the idea will give some measure of control to orchardists who are severely troubled by birds damaging their crops. It is hoped that more experimental fences can be erected during the coming season, and that more detailed observations will be able to be made.

Experiments with Safflower in Western Australia.

A. J. Millington.

In the long and romantic history of yellow dyeing the various plants used as sources of the pigment are known collectively, in common speech, as saffron flowers or safflower. The bindings of the 4,000 year old Egyptian mummies were dyed with flowers of the common or saffron crocus which was apparently the chief European source of this dyestuff. In India and the Far East, use was made of another or false safflower known to botanists as *Carthamus tinctorius*. The group to which this plant belongs contains also the saffron or star thistle (*C. Lanatus*) a serious noxious weed in Australia.

Typically *Carthamus tinctorius* has spiny leaves, but the variety *inermis* used in the recent experiments in Western Australia has spineless leaves except for those surrounding the flower head. The spiny type is usually preferred for oilseed production. For the purposes of this article, it is proposed to restrict the name Safflower to the spineless, *inermis* variety of *Carthamus tinctorius*.

Artificial dye manufactured chiefly from coal tar by-products have now replaced the natural one derived from safflower and it is mainly as a source of oilseed that safflower is cultivated, about 500,000 acres being sown in India each year.

The oil extracted from the seed has a much longer drying time than linseed oil, but it is superior for use in white paints and enamels where permanent whiteness is desired. It is also suitable for use as an edible salad oil.

Analyses of locally grown seed have given an oil yield of about 20 per cent. or only one half that of linseed. The cake remaining after the oil has been extracted from the seed is about the equivalent of bran as a stock food. It differs markedly from other seed meals in having a very high fibre content.

The earliest reported trials with safflower in Western Australia were made by G. F. Berthoud at Hamel State Farm in 1899. The seed was sown on fertile loam at the end of June and the plant matured in late February. This length of growing season is much greater than can usually be obtained in the wheat belt.

In 1941 a further supply of seed was imported into the State by the secretary of the trustees of the W.A. Wheat Pool, Mr. H. E. Braine, and portion made available to the Department of Agriculture for trials on the Research Stations in that year and again in 1942 The first planting was made late in June, 1941, at the Merredin, Avondale, and Wongan Hills Research Stations. The plots at Merredin in particular, showed considerable border effect indicating that a longer

growing season was desirable. This could be achieved only by sowing earlier in the season and consequently the 1942 plantings were made in May. The safflower made little growth during the winter and suffered considerable damage from red legged earthmite and lucerne flea, many plants being totally destroyed. The sparse foliage offered little competition to weeds and considerable volunteer growth occurred.

With warmer spring weather the plants grew rapidly and attained a height of 30-36 inches. The yields at Merredin and Wongan Hills in 1941 were 130 lb. and 687 lb. per acre respectively. In 1942 the yield at Merredin was 64 lb. per acre whilst those at Avondale and Wongan Hills were of the same order.

Flowering top of a typical safflower plant.

The seed is slightly smaller than that of most wheat varieties, but it is readily sown by the ordinary seed drill. Plots were harvested at the Avondale Research Station with a normal header but a heavier crop would necessitate the removal of alternate teeth from the comb. The fine hairs in the seed head caused the harvester driver considerable discomfort.

The potentialities of safflower as a weed is of importance since practically every other member of the genus is classified as such. As mentioned earlier it is closely related to the saffron or star thistle which has been a serious weed in all States of Australia. With these potentialities in mind every care to keep it quarantined was taken during trials on the Research Stations. Although stock readily grazed the young growth, the mature plants would be of little fodder value.

Breeding work is in progress to evolve satisfactory linseed varieties which will escape cutworm damage and resist rust. In view of the unreliability of the summer rainfall in the agricultural areas of Western Australia it is likely that when these are available, they will be a much better source of vegetable oil and pressed cake than safflower.

Grateful acknowledgment is made to the manager, Avondale Research Station, Mr. W. A. Human, and to Messrs. D. R. Bateman and E. Langfield of the Wongan Hills and Merredin Research Stations respectively, for their co-operation in this investigation.

The Red Spider.

(*Tetranychus urticae* Koch.*)

C. F. H. Jenkins, Government Entomologist.

The red spider is a very common pest of vegetables, garden plants and some types of fruit trees during the summer. It should not be confused, however, with the red-legged earth mite (*Halotydaeus destructor*), which is such a serious pest of seedlings, but during the winter season only.

The red spider was first described from Europe as long ago as 1761, and since then it has been recorded from most countries of the world.

Like the red-legged earth mite, the red spider is really a mite, not a true insect, but for all practical purposes it may be treated as such.

GENERAL DESCRIPTION.

The adult female is barely visible to the naked eye, being about one-fiftieth of an inch in length. The colour varies considerably, being often greenish brown or yellowish, but more generally rust or brick red. Darkish spots can usually be seen on the back with the aid of a strong magnifying lens. The male is smaller than the female and usually reddish in colour.

Being true mites, both sexes have eight legs, and not the customary six characteristic of insects.

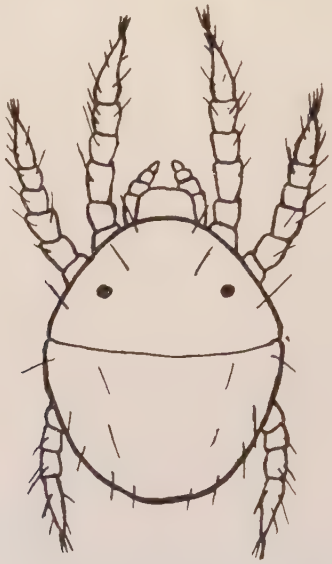
LIFE HISTORY AND HABITS.

The round, somewhat transparent eggs, which cannot be seen without the use of a hand lens, are laid on the under sides of the leaves of selected host plants.

* Usually called *T. telarius*.

Each female may lay from 70 to 100 eggs during her average life of two or three weeks, and usually lays from three to six daily. The eggs are laid irregularly on the leaf surface and under favourable conditions hatch in four or five days.

The young mites are almost transparent on first hatching, and have only six legs. They soon commence feeding and acquire a greenish tinge. Later they moult their first skin and become eight-legged like the adults. In warm weather the mites may reach maturity in a little over a week, so that from egg-laying to adult may occupy less than a fortnight. This rapid development explains how such swarms of red spiders can appear apparently from nowhere to plague our gardens during hot summer weather.



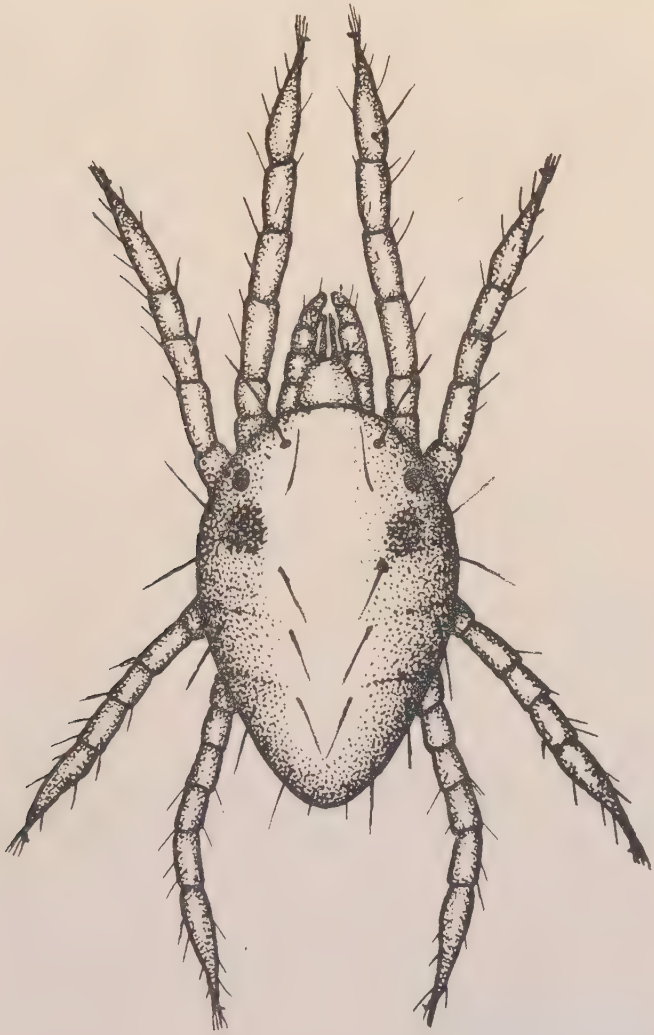
(Univ. Flor. Exp. St.)
Young Red Spider (X 200).

The number of generations which can develop annually has never been worked out locally, but in parts of North America it is known that 24 broods may occur in a single year, and it is likely that a comparable number could develop in many parts of this State.

Although the normal life of the adult red spider, as already indicated, is only about a fortnight or three weeks, under cold conditions this period may be greatly lengthened. The females become inactive, shelter in secluded situations, and in this manner spend the winter. With the arrival of spring they again become active, and lay eggs which give rise to the first spring generation of the pest.

The mouth parts of the red spider are adapted for lacerating the plant tissue and sucking up the resultant oozing sap. The feeding injury causes pale spots to appear on the infested foliage, and soon leaves acquire a mottled and unhealthy appearance. A heavy infestation of the pest may cause the foliage to bleach altogether and finally to shrivel.

The web-spinning habit so characteristic of the red spider increases the disfigurement of the infested leaves. The threads of the webbing are too fine to see with the naked eye, but the under side of a badly attacked leaf often has the appearance of having been dusted with fine powder. This impression is conveyed by the numerous cast skins and excreta of the feeding "spiders" sticking to the leaf.



(Univ. Flor. Exp. St.)
Adult Male Red Spider (X 200).

Being quite devoid of wings or any other means of rapid progression, it may seem surprising that the red spider is so widespread. It has, of course, been carried from one country to another with introduced plants. Local dispersion would occur in the same way, but in addition it is known that the creature may be borne by the wind for considerable distance, and that it can also be swept from higher to lower ground by flood waters.

HOST PLANTS.

A complete list of host plants would be too long to include, but some examples are peas, beans, cucumbers, marrows, cotton, tomatoes, tobacco, violets, carnations, geraniums, and strawberries, as well as many shrubs and deciduous fruit trees.

Tomato shoot showing workings made by red spider.

CONTROL.

The effective control of the red spider entails prompt action and thorough treatments, especially to the under surface of the leaves as soon as the pest is detected.

Lime Sulphur.—Lime sulphur is probably the most useful spray and may be used at a strength appropriate to the plant to be treated. Under summer conditions lime sulphur is liable to burn foliage, and should generally not be used stronger than 1 to 60, and on delicate plants at about 1 to 100.

Sulphur Dust.—Dusting with flowers of sulphur is widely used against this pest with varying degrees of success. Experiments in America have shown that under dry arid conditions dusts are less effective than where the air is humid.

White Oil.—Like lime sulphur, proprietary white oil may be used at varying strengths according to the weather and the type of foliage to be treated. The strongest concentration for plants in summer, however, should not exceed 1 to 40, and may require to be as low as 1 to 100.

Black Leaf 40, so useful as a contact spray against most insects, has proved disappointing against red spider in American experiments, and home-made sprays such as kerosene emulsion have given far better results.

Kerosene Emulsion.—Kerosene emulsion may be made as follows:—Dissolve ½ lb. of soap in one gallon of hot water. Add slowly two gallons of kerosene, stirring violently the while. This makes a stock solution which may be kept. When required for use the stock solution may be broken down at the rate of one part to 8-14 parts of warm water. The weaker strengths should be used on delicate foliage or during very hot weather.

Flour Paste.—Another simple preparation which has been successfully used is flour paste. The stock material is prepared by making a boiled paste with 1 lb. of flour and a gallon of water. For use against the pest it is broken down at the rate of one part of stock to nine parts of water, and applied with a strong spray pump so as to thoroughly coat the foliage above and below.

Cultural Methods.

It has been frequently shown that the red spider thrives best under hot, dry conditions. Where plants can be kept well watered, especially with overhead sprinklers, the result is a definite drop in the "spider" population, and this means of control is adopted by many gardeners.

As the red spider attacks many weeds as well as cultivated plants, the necessity for clean cultivation will be self evident.

Mycotic Dermatitis ("Lumpy Wool") and Fleece Rot of Sheep.

C. R. TOOP, Senior Veterinary Surgeon.

During recent months a number of samples of matted wool from the higher rainfall areas of the southern districts have been forwarded for examination. An investigation has revealed the presence of two similar, though not identical conditions, viz.: mycotic dermatitis or "lumpy wool" and fleece rot. The existence of both conditions has been recognised in this State for a number of years, but since the cases encountered have been isolated or sporadic in nature their occurrence has hitherto been regarded as a matter of minor importance.

During the present season, however, a considerable number of flocks were reported to have become affected; a high percentage of the younger sheep showing evidence of matted and sometimes discolored wool at shearing time. In such flocks considerable losses have been sustained both as the result of damage to the fleece, and the difficulty of shearing badly affected animals from which much of the wool cannot be removed. Moreover, affected sheep are rendered highly susceptible to blowfly attack. Body strikes may occur, which unless promptly treated are likely to become extremely severe.

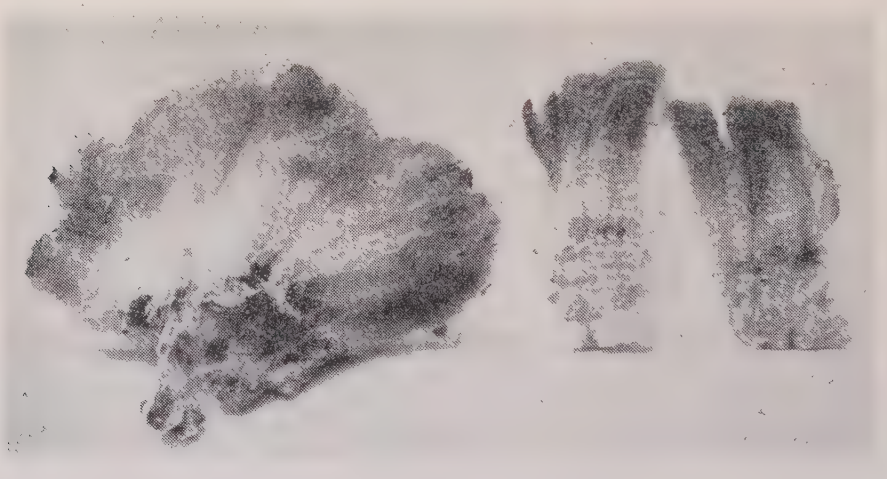
Both mycotic dermatitis and fleece rot are dependant for their development upon the presence of moisture in the fleece. They are consequently only likely to occur in seasons of high rainfall during which the fleece is frequently soaked in water. Abnormal summer and autumn rains accompanied by humidity, warm temperatures and a luxuriant growth of pasture may be regarded as having been responsible for the widespread occurrence of both conditions during the present season.

MYCOTIC DERMATITIS ("LUMPY WOOL").

This condition is caused by a fungus known as *Actinomyces dermatonomus*, which is widely distributed in the soil and elsewhere. It is frequently present in the wool of sheep. During seasons of high rainfall when conditions of moisture are favourable to the organism it grows in the wool, and invades the underlying skin, setting up a condition of inflammation or dermatitis accompanied by exudation, and the formation of crusts or scabs, which bind the wool fibres firmly together. As the condition develops areas of hard matted wool make their appearance in the fleece. The affected areas are roughly circular in outline, measuring from a quarter of an inch to an inch or more in diameter, and extending from an inch to about three inches along the wool fibres. Upon examining an affected sheep, hard horn-like processes will be detected projecting upwards into the fleece. In full woolled sheep the external half of the fleece usually shows no alteration; externally the animal is normal in appearance, and the condition may only be discovered during shearing. This condition is usually confined to the back and sides of the animal, though isolated cases have been observed where other portions of the body including the head and limbs have been affected. In advanced cases isolated areas of affected wool become confluent and in consequence large areas of the skin become covered with hard masses of matted wool. The matted wool is firmly adherent to the underlying skin, leaving a raw bleeding surface if forcibly detached. With the passage of time the crusts tend to separate from the skin, and are pushed outwards by a new growth of wool from beneath. Shedding of the affected wool may subsequently occur.

Mycotic dermatitis is largely a disease of young sheep, older animals being much more resistant. The disease does not usually recur. An animal affected during one season is generally found to be unaffected at the following shearing. The disease has been observed chiefly amongst merinos; crossbreds are, however, susceptible and occasional cases have been reported amongst the British breeds.

Usually the general health and condition of affected sheep is not seriously impaired. Considerable losses are, however, sustained from the reduction in value of the damaged fleece. Moreover, the presence of the hard horn-like lumps in the wool renders shearing difficult, and frequently impossible.



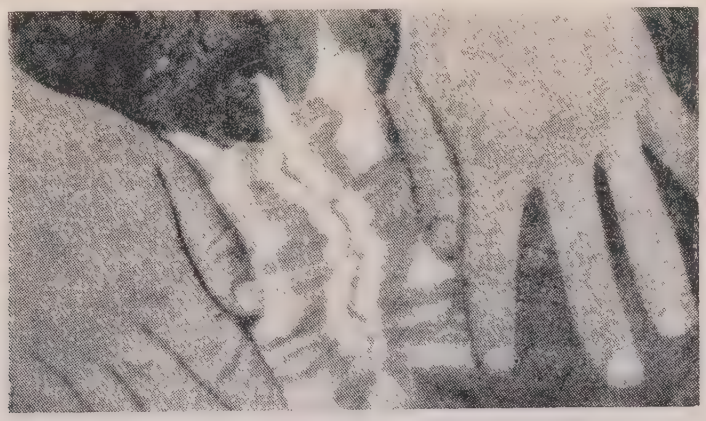
Mycotic dermatitis.—Note matting together of wool fibres with crusts of hardened exudate.

Prevention.

The fungus is destroyed by copper sulphate in a strength of one in five hundred. Dipping in such a solution, which may be prepared by the addition of one pound of copper culphate (bluestone) to every fifty gallons of water, may therefore be found effective as a preventive measure. Dipping should be carried out during late autumn and the treatment may be repeated after an interval of ten days as an additional precaution. It should at the same time be recognised that the disease is unlikely to reappear except in excessively wet years. Bluestone in the strength mentioned does not stain the wool.

FLEECE ROT.

Like mycotic dermatitis, fleece rot occurs under conditions of excessive rainfall. It is caused by the multiplication of bacteria on the skin. The bacteria responsible are commonly present in the soil, especially in the vicinity of sheep yards, and are carried into the wool by dust. When the wool remains wet for prolonged periods, and particularly if the atmospheric conditions are warm and humid, these organisms multiply rapidly on the surface of the skin, setting up an inflammatory process with the formation of an exudate, which mats the wool fibres together. The wool covering the withers, back and sides is most commonly affected. The examination of an affected sheep will reveal the presence of a greyish yellow band of matted wool, one eighth to half an inch in width at a level in the fleece corresponding with the period when the inflammatory process occurred. Should the condition recur with the onset of further rains a second band may be observed, but at a lower level in the fleece, closer to the skin. There is an entire absence of the lumpiness so characteristic of mycotic dermatitis.



Fleece rot.—Note band of matted discoloured wool. The later growth of wool closer to the skin is unaffected.—After Seddon.

Some of the organisms responsible for the development of fleece rot, during their growth produce pigments which discolour the wool. Colours including green, yellow, blue, red, brown, violet and black have been observed. A green discoloration of the wool caused by an organism known as *Pseudomonas aeruginosa* is commonly observed in this State. The discoloration is usually confined to the matted bands of wool, but may be diffused throughout the greater portion of the staple, extending almost to the tip.

Young sheep 6-12 months old are more severely affected, probably on account of the openness of the fleece, which allows the penetration of moisture. Sheep of all breeds are susceptible, but the condition has been most frequently observed in merinos.

Since the bacteria responsible are widely distributed in the soil, and are therefore probably always present in the wool, fleece rot is not amenable to control by dipping.

Belschner, who has investigated this condition in New South Wales, particularly in reference to its association with blowfly strike, has observed that some sheep are much more susceptible to fleece rot than others. He considers that body conformation and fleece character have an important bearing upon its development. Sheep showing faulty conformation, including a "pinch" or "grip" behind the withers, high shoulder blades and broad withers with a depression between the shoulder blades, all of which conditions favour the entrance and retention of moisture, are predisposed to fleece rot. Furthermore, sheep carrying wool which is harsh to handle, shows a good deal of yellow coloration of yolk and lacks character are considered to be much more susceptible than sheep in which the wool is bright in colour, soft to handle and exhibits good character.

Belschner considers that the incidence of fleece rot could be considerably reduced by the systematic culling of sheep showing these undesirable characteristics.

Blowfly Strike.

Sheep affected by both fleece rot and mycotic dermatitis are rendered susceptible to attack by blowflies. An odour attractive to the fly is produced and the moisture present is favourable to the development of the maggots. Extensive strikes involving the withers, back and sides may result and unless promptly treated these may cause the death of the animal. Treatment involves the removal of a considerable amount of the most valuable part of the fleece.

The Preservation of Fruits in the Home.

Ray C. Owen and W. J. Bettenay.

The importance of fruit as part of the human diet has long been recognised as a factor in maintaining bodily health and the slogan "Eat More Fruit" could probably be practised to advantage by us all. Most fruits with which we are familiar contain in addition to carbo-hydrates and proteins, certain amounts of mineral salts, besides appreciable quantities of vitamins. The organic acids, too, together with the roughage or fibrous part of the fruit, do much to keep the human system functioning correctly. In Western Australia many fruits can be grown to perfection, and while in season, little trouble is experienced in obtaining supplies of any particular variety. Unfortunately the harvesting period of certain varieties is of very short duration, and to enable supplies to be carried throughout the year, it is necessary to resort to some method of preservation.

To preserve fruit means to keep it in a sound condition so that it will be fit for human consumption for a longer period than its normal season. It is not the purpose of this article to describe all methods of food preservation, but two

popular methods by which fruit can be preserved in the home will be dealt with. In view of the general food shortage, and the fact that many of the products from our commercial food factories are required for the fighting services, every effort should be made to preserve at least part of the coming crop for use when fresh fruit is scarce or unobtainable.

Fermentation and putrefaction are two changes by which perishable foodstuffs may be rendered unfit for human consumption and they are brought about by tiny living organisms such as bacteria, moulds, etc. Fresh fruits are readily acted upon by these micro organisms, once they have gained access through the skin, and successful preservation processes usually involve either—

(1) The destruction of these organisms (generally by heat) then hermetically sealing the product to prevent reinfection, e.g., canned or bottled fruit and fruit juices.

(2) Changing the nature of the product so that the growth of spoilage organisms is inhibited as in dried fruit.

Both these methods may result in some loss of vitamin content, but if the operations are carried out with due care, the loss can be kept to a minimum and the colour, flavour, and texture of the final product will not be unduly impaired. Practically all types and varieties of fruit can be bottled or dried as desired but some lend themselves better to bottling, whilst others yield a much superior dried product. Vine fruits are almost exclusively preserved by drying.

CANNING OR BOTTLING OF FRUIT.

Canning has been defined as the preservation of foods in hermetically sealed containers by sterilisation by heat. In its broader sense it includes preservation by sterilising in glass containers as well as in tin cans. Glass jars are used almost universally as containers for home "bottled" fruits, and because glass is easily cleaned and is unaffected by fruit acids, these jars are ideal for the purpose. Care must be used in the handling of glass containers, and they should never be subjected to sudden changes of temperature. Jars for bottling fruit should have a wide mouth to allow of easy filling, and should be fitted with screw tops or covers which can be held in place by metal clips. They should also be equipped with suitable rubber rings to ensure a perfect seal between the cover and the jar. This is most important, as an improperly sealed cover would allow the entry of spoilage organisms and the product would soon be unfit to eat.

The equipment necessary for the bottling of fruit in the home is very simple, and apart from the containers to hold the finished article, consists essentially of a vat or sterilising vessel in which the jars are placed whilst being sterilised. There are on the market well-known makes of sterilising outfits, fitted with suitable stands and equipped with thermometers, but in an emergency the washing copper or a kerosene tin may be used for the purpose. A rack or platform should be placed in the bottom of the steriliser to keep the jars from coming in direct contact with the bottom. Sufficient water is added so that its surface is just below the level of the rack, and a reasonably tight fitting lid or cover is fitted to retain most of the steam when processing takes place. In between batches the level of the water must be checked to obviate the danger of boiling dry. A thermometer is useful but not really essential when preserving tree fruits, as all of these varieties can be sterilised at temperatures below the boiling point of water, and temperatures up to 212° F. are not really harmful. The time necessary to give adequate sterilisation varies with the type of fruit being processed, but the simplest method is to process until the product is properly cooked, and this can be determined by

testing the firmness with a sterilised darning needle or knitting needle. Probe into the centre of the jar and if the product is sufficiently cooked, the texture will be soft but not mushy. The times given for each variety are only approximate and should be taken from the time the water in the steriliser reaches boiling point. Large jars will naturally need a longer cooking process than smaller containers as the heat penetration is more rapid in the latter. Overcooking spoils the appearance of the fruit and causes it to rise in the jar.

Fruit for bottling should be of the best quality, i.e., free from blemishes, of a good colour, full flavour and firm texture. Soft or over-ripe fruit will not stand up to the cooking process, and the product is likely to be mushy. In general, poor fruit is not worth the trouble of bottling and would be better made into jam. Fruit may be bottled with or without the addition of sugar syrup but the majority of fruits retain a better flavour when bottled in syrup than when plain water is used. The strength and consistency of the syrup may be varied according to taste or in keeping with sugar supplies. A good syrup suitable for most fruits can be made by using 4 to 6 ounces of white sugar to a pint of water. If too much sugar is used the syrup will be so dense that the fruit will have a tendency to rise or float to the surface. In making the syrup the required amount of water is brought to the boil in a suitable vessel—one fitted with a spout will facilitate pouring the contents into the jars—the sugar is added, and after boiling for 10 minutes the syrup is ready for use. Prolonged boiling will evaporate a portion of the water and thus increase the strength of the syrup.

General Preparation of Fruit.

As mentioned previously the fruit should be selected for quality and ripeness, and any which is inferior or over-ripe should be discarded. A thorough wash in cold water is advisable to clean the fruit from dust and grit. Different kinds of fruit need different preparation treatment as detailed hereunder.

Peaches.—Most varieties are suitable, but those with firm flesh are preferable as they do not break up during processing. Some people consider that the yellow-fleshed varieties look more attractive than the other types. Peaches should be peeled, and may be preserved whole or halved, or sliced as desired. Peeling can be done by hand with a knife, or by dipping the fruit in a boiling caustic soda solution for half a minute or so. The latter method is only suitable for solid fleshed canning varieties of peaches. The dip is made by using 4 ounces of caustic soda to a gallon of water, and after dipping, the peaches are thoroughly washed in several changes of fresh cold water to remove the particles of skin. When peeling by hand it is sometimes noticed that certain varieties tend to discolour if exposed to the air. If these are cut and placed in a weak salt solution and kept there till ready for bottling, no discolouration will occur. When prepared, pack the fruit in the bottles as firmly as possible without crushing, and cover with cold syrup, place in the steriliser, and process for 30 to 40 minutes, after which time remove from the steriliser, top up with boiling syrup and seal immediately.

Plums.—Practically all varieties of English plums and most of the firm fleshed Japanese plums are suitable for bottling. They are often preserved whole without removing the stones, but if desired they may be halved and stoned. Pack tightly into the jars, but only partially fill with syrup. Process for 10 to 15 minutes at boiling point or from 30 minutes at 170° F. The lower temperature is said to prevent the skins from cracking. Fill with boiling syrup before closing the jar.

Apricots.—Mid-season and late varieties are superior to the early types and may be bottled as whole fruit or as halves, but the skin is not removed. Here

again it is advisable to only partly fill the jar with syrup before processing, but be certain to top up with boiling syrup before sealing. Process for 20 to 25 minutes.

Nectarines.—Prepare and treat as directed for apricots.

Pears.—Bartletts and Packham's Triumph appear to be the best varieties for bottling, as they are well flavoured, and retain their white colour. The fruit should be used before it becomes ripe enough to eat. The stems are removed and the pears peeled and halved or cut into quarters if too large. Trim out the core and pack into the jars and cover with cold syrup. Sterilise for 25 to 30 minutes and finish off as described for other fruits.

Quinces.—These should be peeled and sliced, at the same time removing the core. As there is a tendency for the pieces to discolour, it is desirable to keep them in salted water till ready to fill the jars. Rinse in cold water and after packing into the jars, fill with cold syrup and sterilise for 30 minutes or so. Long cooking gives a red to pink colour, whilst a short cook gives more of a golden tint to the fruit. Top up with boiling syrup, and seal the jars as promptly as possible.

Tomatoes.—These may be bottled whole or in pieces, peeled or with the skins left on. Wash in cold water to remove any dirt, immerse in boiling water for 1½ to 2 minutes to facilitate peeling, and core with a sharp knife. Place a teaspoonful of salt in the bottom of each jar, pack the tomatoes in tightly, and fill with water. Sterilise for 25 to 35 minutes, top up with boiling water and seal.

Other varieties of fruit can be prepared, using methods similar to those described above.

Sterilising.

After the fruit has been prepared and packed firmly into the jars with or without syrup, the lids or covers are placed loosely in position without the sealing rings. The containers are then packed into the steriliser, which should be fitted with a rack or platform to keep the bottles from contacting the bottom of the steriliser. The vessel is then partly filled with water and placed over a fire or other heating appliance, until the water has boiled sufficiently long to sterilise the fruit. When sterilising is complete, the bottles are taken out one at a time, the covers removed, and after fitting the rubber rings, each is completely filled to overflowing with boiling syrup. The cover is then screwed or clamped firmly into position. This should be done in a warm room free from draughts. As the bottles cool, a vacuum is formed in the headspace above the contents, and this vacuum indicates a perfect seal between the bottle and the cover.

The vacuum may be tested when the jar has cooled by loosening or removing the clips, and then lifting the jar by the cover. If the seal is imperfect there will be no vacuum present and the cover will lift readily without raising the bottle. Screw-top jars may be inverted and stood on their covers whilst cooling and any imperfection in the seal will be shown by air bubbles originating at the seal and rising to the surface of the syrup. Should the bottled fruit begin to bubble or ferment within a few days of bottling it means that there has been a bad seal or the fruit has not been sufficiently sterilised. The lid should be removed and the bottle again sterilised for 10 to 12 minutes, overflowed with boiling syrup and resealed, preferably with a new rubber ring.

When properly sealed and sterilised, bottled fruit will keep in good condition for years, but the bottles should be stored in a cool dry place, preferably in the dark, as exposure to direct light is likely to bleach the colour and spoil the appearance of the contents.

There is also another method for the home bottling of fruit which is quite successful, and if anything, even more simple than the one described. This is known as the "Open pan system," or the "Hot filling" method, but is not altogether suitable for the preserving of the softer types of fruit, especially raspberries and strawberries. The fruit is prepared in the usual way and then placed in a suitable cooking vessel. An enamel-lined preserving pan is ideal for the purpose, but a large aluminium pot is quite suitable. Add sufficient sugar syrup to cover the fruit, and place over the stove or open fire and gently boil till the fruit is properly cooked. While the fruit is cooking the empty bottles are preheated and sterilised by being boiled in water and then whilst still hot, are filled with the cooked fruit. Sealing rings are fitted, and then the jars overflowed with boiling syrup and the covers are clamped on as previously described.

Special Note.—It is worth noting that owing to the shortage of rubber, manufacturers have found it necessary to make the sealing rings from reclaimed rubber. These are inclined to have a strong rubbery smell which has at times tainted the preserved fruit. To eliminate this objectionable feature, it has been advised that new black rubber rings should be thoroughly washed in hot water and scrubbed in the palm of the hand as though washing clothes, and then rinsed in clean cold water. They should be stretched to their full extent half a dozen times before fitting on the jars.

It has also been advocated that in addition to this treatment the rings should be soaked in a basin containing a little of the syrup used in preserving the fruit. This lot of syrup would naturally be discarded afterwards. Should the fruit have a slight rubbery taste when the jars are opened, empty the contents into a dish and allow to stand for 10 minutes before using, or if it appears very pronounced, place in a saucepan and bring to the boil. Empty into a dish and allow to cool, by which time the rubbery taste should have disappeared.

HOME BOTTLING OF VEGETABLES.

Vegetables in general contain much less acid than fruits, and also because there is a likelihood of contamination by certain soil bacteria, they require a much longer cooking process to ensure proper sterilisation.

Commercial canning processes involve pressure cooking at temperatures of 240° to 250° F. for periods of 30 to 40 minutes (according to the variety being treated), so it will be realised that ordinary household methods of food bottling cannot be regarded as adequate for the preservation of vegetables. For this reason there is a certain element of risk associated with the eating of home bottled vegetables, therefore this method of preservation cannot be recommended.

FRUIT DRYING.

As mentioned previously, most kinds of fruit can be successfully preserved by drying or dehydration. The principle underlying the process is to render the product so dry that any spoilage organisms are unable to develop. With dried fruits the sugars and organic acids become so concentrated that they, too, materially assist in keeping the product wholesome. Vegetables, because they are very low in sugars, must be dried to a much lower moisture content in order to keep them satisfactorily, and a moisture content of 4 to 8 per cent. is necessary with dried vegetables, whereas dried fruits keep well, even when containing up to 20 per cent. of moisture.

The term "dried" as regards fruit is usually applied to those fruits which have had the moisture removed by natural heat, that is, dried in the normal atmosphere by the heat of the sun. "Dehydration" on the other hand, generally indicates the process where the moisture is removed by artificial means, that is, dried in a chamber which is subjected to forced draught and artificially applied heat. The greater part of Australia's dried fruit crop, consisting of dried peaches, apricots, prunes, pears, currants, lexias and sultanas, is sun dried, and artificially heated dehydrators are only occasionally used to finish off the drying process when the weather is unsuitable. Dried or dehydrated apples, on the other hand, are mainly dried in tunnel or kiln type dehydrators, using artificial heat. The chief point in favour of sun drying is that it is much cheaper than artificial dehydration, because no expensive drying plant is involved. There is no doubt, however, that with artificial dehydration, where both the humidity and the temperature can be controlled, a superior product can be obtained. Research work has indicated that tree fruits such as peaches, apricots and pears, if blanched in steam or water for periods up to five minutes prior to sulphuring, and then dehydrated in a tunnel dehydrator, not only have a better colour, flavour and texture than the sun dried article, but vitamin retention is higher and the keeping qualities are very much improved.

This blanching treatment is advantageous in that it—

1. Enables the fruit to absorb sulphur fumes much more readily than with unblanched fruit, and so reduces the time necessary for sulphuring.
2. Accelerates the drying rate by as much as 30 per cent.
3. Reduces the tendency of the fruit sticking to the trays.
4. By inactivating the enzymes responsible, much darkening of the fruit during storage is prevented.

It is possible that blanching treatment and artificial dehydration will be adopted as a general practice in treating Australia's dried tree-fruit crop after the war, but much will depend on whether the increased costs of these methods will be repaid by the enhanced prices that the superior product should command on the world's markets.

Although the underlying principles are the same, each type of fruit has its individual method of treatment prior to and during drying or dehydration, and the methods described here are applicable to the drying of fruits in the home. In commercial practice vine fruits (with the exception of raisins which are dried on trays), are dried on permanent racks having timber frames and with tiers of wire netting racks arranged one above the other, and with a suitable roof to afford protection from the weather. Hessian sides or curtains are provided to shield the fruit from the direct rays of the sun, which have a tendency to bleach the fruit. These curtains provide useful shelter from rain which may be blown on the fruit should a storm occur during the drying period. The racks must not be kept too closely covered as moulding is likely to occur if the humidity is very high.

When placing the fresh fruit on the racks, the top tiers are filled with fruit and a sheet of hessian is placed on the bottom tier to catch the loose berries which fall through from the tiers above. This hessian also collects the dried berries as they are shaken down prior to being placed in the sweat boxes. Tree fruits are generally dried on wooden trays which can be spread out in the sun for drying or stacked one above the other and covered, if necessary, to protect from rain, heavy dews or dust storms.

Currants should be left on the vine until thoroughly ripe, and of an even dark colour. After picking they are spread one bunch deep on wire netting trays or racks. The trays should be stacked one above the other and the top one covered to protect the fruit from the direct rays of the sun. In good weather the currants will take from two to three weeks to dry sufficiently to shake off the bunches. It will be found, however, that the individual berries are not uniformly dry and it is necessary to place them in sweat boxes (petrol or kerosene cases are often used) for the moisture to become uniform throughout. This will take several days, by which time the currants will be ready for cleaning, to remove the remaining stalks, cap stems, dust and other foreign matter. In large commercial packing sheds this cleaning is done by special machinery, but in the home it must be done by hand methods.

Sultanas must be fully ripe before picking if a good finished product is desired. If allowed to dry without any preliminary treatment, sultanas would have a dark bluish appearance, due to the natural bloom on the fruit, and would look very unattractive. To remove this bloom or waxy covering, the fresh fruit is immersed in a caustic dip for a few seconds. Commercially the "cold" and the "mixed" dips (using caustic, potash, olive oil and a suitable wetting agent) are favoured. With these the finished product is a much lighter and brighter colour. However, the "hot" dip is still used by some, as the berries dry much faster, but the resulting dried fruit is definitely of the brown type. For home drying purposes the hot dip is the simplest and consists of placing the fruit in dipping baskets and immersing for one to two seconds in a boiling caustic solution made by using approximately 1 lb. of caustic soda to 30 gallons of water.

A serviceable dipping basket can be made by freely perforating a kerosene tin bucket with a suitable punch. The holes should be punched from the inside so that any sharp edges will be on the outside and will not come into contact with the fruit. Any large vessel in which water can be kept boiling will serve as a dipping tank. It should be equipped with a draining board so that excess liquid from the dipped fruit can drain back into the tank. Freshly dipped fruit should show minute cracks barely visible to the naked eye, in the skin. Allow the dipped fruit to drain for half a minute and then spread on racks or wire trays as recommended for currants. When the berries are sufficiently dry, so that no juice exudes when pressed between the finger and the thumb, they can be exposed to the sun to complete the drying process. After this the fruit is placed in sweat boxes and finally cleaned to remove stems and any other foreign matter.

Lexias and Raisins.—When Muscat Gordo Blanco grapes are dipped and dried, they become lexias, but when dried without dipping (usually on trays in the sun or in a dehydrator) they become table raisins or muscatel clusters. Lexias should have a rich golden brown colour, and should be large and well bodied. Table raisins have a dark bluish brown colour, and should retain their natural bloom. As with currants and sultanas the fresh fruit must be allowed to ripen thoroughly on the vine before picking. The most satisfactory dip for lexias is the boiling caustic dip, using approximately 1½ lbs. caustic soda to 50 gallons of water. Test a sample of fruit by dipping for two or three seconds in the boiling solution, and if necessary add more soda until the skin is cracked satisfactorily, but if the skins are tender and crack too much, dilute the dip by adding more water. The dipping solution should be kept boiling whilst dipping is being carried out. After draining the bunches are spread on racks to dry and when sufficiently dry are rubbed off the bunches, exposed to the sun, if necessary, then allowed to sweat in boxes before cleaning.

Drying of Prunes.—Suitable varieties are Prune d'Agen, Robe de Sargent, Splendour, Fellenberg, Imperial and sugar prunes. The fruit must be perfectly tree ripened, in fact it is preferable to allow the fruit to fall to the ground and be picked up rather than to be picked too soon. Only sound fruit should be used. Prunes are dried whole usually after dipping in boiling caustic solution. The strength of the dip may be varied with the condition of the fruit, but after a dip of five seconds, very small cracks should be visible in the skin of the prunes. A strength of 1 lb. caustic soda to 40 gallons of water is usually sufficient for Prune d'Agen. The solution must be kept boiling throughout dipping operations. Where large quantities of fruit are to be dipped, the dipping solution should be changed frequently as it becomes loaded with syrup and this covers the fruit, thus preventing the prunes from drying quickly. The fruit should be allowed to dry for several minutes before being spread on wooden trays. In hot weather the freshly dipped prunes should not be exposed to the sun, but should be kept shaded for several hours, as there is a tendency for the skins to burst. As drying proceeds the prunes should be turned at intervals to allow of more even drying. Any broken or faulty fruit noticed are better discarded at this stage. Usually the small fruits will have dried sufficiently before the larger ones, and it is a good practice to remove these from the trays before they become too hard. They should feel tough but should not exude any moisture when squeezed between the thumb and finger. The flesh should be meaty, but not hard and dry. After removal from the trays prunes are placed in large sweat boxes for two to three weeks, during which time they can be turned and mixed by pouring from one box to another. After thorough sweating, dip the fruit in clean hot water and dry again in the sun for a few hours before being packed for storage. A better appearance is given to the fruit if a small quantity of glycerine (1 lb. to 20 gallons) is added to the hot water in the final dip.

Figs.—Light coloured figs are best for drying, as the product has a better appearance than that from the dark varieties. They must be thoroughly ripe and care should be exercised in picking to see that the stems are retained on the fruit. After gathering the figs are dipped in a solution of boiling brine for three seconds. This brine is prepared by dissolving 3 ozs. of common salt in each gallon of water. This dip improves the texture of the skin and facilitates the evaporation of the water from the figs. After dipping the fruit is spread on wooden trays and placed in the sun to dry. The figs should be turned after a few days to expose the underside and so prevent moulding. In good weather the drying will be complete in seven to 10 days. As with other fruits the trays should be stacked and covered in the event of rain or heavy dews intervening during the drying period. When removed from the trays the fruit should still be pliable, but not sufficiently moist to exude juice when pressed between the thumb and finger. Sweating in boxes for a fortnight will ensure that the moisture has become uniform. Before packing the fruit is again dipped in the brine solution and quickly dried in the sun. This last dip removes dirt and grit and makes the skin smooth and pliable.

Peaches.—For home drying purposes free-stone yellow fleshed varieties such as Elberta, Muir and Blackburn are most suitable, but clingstone canning types such as Pullar's Cling and Golden Queen, etc., may be used. The fruit should be picked when fully mature and kept till fully ripe, but still firm, and then halved and the stones removed. This is a simple operation with free-stone varieties, but with clingstones a special knife or sharp edged spoon is necessary to remove the stone. Peaches may be dried without peeling, but if preferred may be peeled either by hand with a knife or by means of a caustic dip, followed by rinsing several times in cold water. In order to prevent the peaches from darkening, both during

the drying period and during storage, they are sulphured immediately after being halved. The prepared fruit is placed on wooden trays with the cut side uppermost and the trays are then stacked in an airtight chamber and subjected to sulphur fumes, produced by burning sulphur with a minimum supply of air. If a suitable sulphuring chamber is not available, the trays may be stacked in the open and covered with a heavy tarpaulin which is sealed at the bottom by covering the lower edges with damp earth. Space should be left at the side of the stack for the container in which the sulphur is to be burned. Usually 1 lb. of sulphur for every hundred cubic foot of space contained in the chamber or under the tarpaulin is required. This amount is placed in a fire pot in the chamber and when ready for sealing the sulphur is ignited with a few burning coals. The fruit should be left in the sulphur chamber for 10 to 12 hours, after which the trays are spread out in the sun till the peaches are dried. In favourable weather drying should be complete in four to six days, but if wet weather intervenes, this period may be greatly extended, and if unduly prolonged, it is necessary to resulphur the partially dried fruit. When completely dried the peaches are taken off the trays and stored to prevent infestation by insects, such as weevils and dried fruit moths.

Apricots.—Suitable varieties are Royal, Oullins, Blenheim, Travatt and Moorpark. These are picked at the firm ripe stage, and are halved and pitted but not peeled. Sulphuring is necessary, and the treatment is as described for the drying peaches.

Pears.—The Bartlett is the favoured variety for drying, and the fruit should be picked when mature, but still hard, and then ripened in boxes. When the pears are firm yellow ripe, the stalks are removed and they are peeled, halved, and the cores removed. The halves are placed on wooden trays with the cut side uppermost and then subjected to sulphur fumes. Because pears absorb sulphur very slowly, the minimum time of 12 hours is necessary, and sometimes double sulphuring for periods up to 30 hours is practised. When sulphuring is completed the pears are so soft they cannot be lifted from the trays. The trays are spread in the sun for two to three days, and then stacked and the top covered so that the final drying is in the shade. When dry the pears should have a clear golden semi-transparent appearance, and should be firm but not moist.

Apples for drying must be properly ripe and crisp, but not mealy. Dunns, Cleos, Granny Smiths and Rokewoods have been successfully used in Western Australia. In commercial apple drying factories, fruit is peeled, cored and sliced by special machinery, and there has been on the market small hand operated machines suitable for use in the home. These machines save a lot of tedious work and there is no doubt that they turn out a more uniform product than when peeling and coring are done by hand. The apples are peeled and cored and then cut at right angles to the line of core into slices ¼in. to 5/16in. in thickness. By this method the majority of slices are in the form of rings, and this form has been accepted as ideal for dried apples. The cut fruit should be prevented from coming into direct contact with iron as an objectionable blue stain is likely to appear on those portions which have touched any iron surface. Sliced apples discolour very quickly on exposure to air, and unless they can be sulphured immediately after cutting, it is advisable to keep the slices immersed in a one per cent. brine solution (made by adding 1 lb. of salt to 10 gallons of water) or in a solution of potassium meta-bisulphite (1 lb. to 40 gallons). This latter solution imparts a considerable amount of sulphur dioxide to the apple slices and for short storage will obviate the need for further sulphuring. If the dried apples are intended for long storage, however, the sulphur dioxide content must be kept much higher and it is advisable to subject the prepared slices to sulphur fumes as recommended for other tree

fruits, and for a period of 45 to 50 minutes. After sulphuring, if a dehydrator is not available, the slices are spread on netting or wooden trays and dried in the sun. They should be dried as quickly as possible, and it is advantageous to turn them several times during the day. When nearly dry, bulk the fruit from six trays to one tray and resulphur in the chamber for one hour. The dried fruit is placed in sweat boxes for a week, and then stored in airtight containers away from the light.

All dried fruits are liable to attacks by insects, such as weevils and dried fruit moths, and unless protection is afforded from these pests, a great part of the stored dried fruit may be damaged or destroyed. Dried fruit should be stored in airtight containers as soon as possible after drying, and to ensure that no insects or insect eggs are present at the time of packing, they should be treated with a fumigant such as Ethyl formate. This substance is manufactured in Australia, and sold under the trade name of Eranol Z.3. It is a volatile liquid, and is applied to the fruit at the time of packing, and immediately before being sealed. Half a teaspoonful per 20 lbs. of fruit is a suitable quantity to apply.

TREATMENT OF DRIED FRUITS PRIOR TO USE.

Dried tree fruits, particularly apricots, peaches and prunes, should be soaked for a considerable time before cooking. Use plenty of water, and soak for at least 24 hours. The fruit should then be allowed to come to the boil slowly in the water in which it was soaked, and boiled gently till plump and tender. The sugar should be added just before the cooking process is completed.

Soybean Inoculation Experiment.

W. P. Cass Smith, Plant Pathologist, and H. L. Harvey, Assistant Plant Pathologist.

INTRODUCTION.

A crop which to date has been cultivated to only a limited extent and on the whole unsuccessfully in W.A., but whose potentialities are considerable, is the soybean. The many valuable qualities which make this legume suitable for human and stock food and the production of oils, paints, soaps, rubber substitutes, etc., have been demonstrated elsewhere and are well known.

Like other legumes the soybean grows in association with bacteria which stimulate the formation of nodules on its roots and which enable such plants to obtain their supplies of nitrogen from the air. The bacteria are therefore an important factor in the nitrogen nutrition of the plant.

In the absence of these nodule-forming bacteria, the successful growth of a soybean crop is extremely unlikely in soils low in available nitrogen and probably the unsatisfactory results previously obtained locally with this legume have been largely due to this cause. In more fertile soils the soybean may grow satisfactorily even in the absence of these nodule-forming bacteria, but in this case it is obvious that growth can only take place at the expense of the available nitrogen in the soil. It is advisable, therefore, to inoculate the seed, before planting, with a culture of an effective strain of this organism and the experiment described was conducted to ascertain the relative effectiveness of a number of recently imported strains.

DETAILS OF EXPERIMENT.

In December, 1942, an experimental sowing of soybeans was made on swamp land at Jandakot, using three different strains of bacteria. With untreated (control) rows the experiment comprised, therefore, four rows which, when repeated at random seven times, gave a total of 28 rows. Each row measured ½ chain in length and the distance between rows was 4 links. The spacing between seeds was 4 inches and the variety used was Easycook, a variety suitable for both human and stock food. Superphosphate was applied at the rate of 4 cwts. per acre.

Treatments were:—

1. Seed inoculated with soybean culture ex Eastern States.
2. Seed inoculated with soybean culture ex U.S.D.A. (599).*
3. Seed inoculated with soybean culture ex U.S.D.A. (663).*
4. Seed not inoculated (control).

The seed was planted by hand on 15th December, 1942, and during planting, shade temperatures were in the vicinity of 100° F.

An inspection made on 1st January, 1943, showed the germination to be about 60 per cent. in all treatments.

RESULTS.

On 24th February, 1943, before plants had reached the flowering stage, treatments 2 and 3 in all seven blocks had made better growth and were slightly darker green in colour. On 18th March, 1943, six of the seven blocks were harvested and green weights taken at the flowering and early pod stage. At harvesting time treatment 2 appeared the best row in all blocks, being slightly taller than 3, its dark green foliage standing out in each block in contrast to the remaining rows. It reached about 2ft. 6in. in height. Treatments 1 and 4 were conspicuously smaller than 2 and 3, treatment 1 being slightly better than 4.

All six rows of each treatment were bulked after cutting and weighing, and a composite sample of each of the four treatments was taken for nitrogen analysis.

Green weights (average of six blocks) of rows, and nitrogen are presented in Table 1.

Table 1.

Treatment.	Average Green Weight per Row.	Moisture.	Nitrogen on Dry Weight.	Nitrogen per Row (Average).	
	ozs.	%	%	gm.	%
1	207	74·9	1·73	25·5	121
2	292	77·3	2·35	44·3	210
3	284	72·0	1·74	33·7	160
4 (control)	203	74·2	1·41	21·0	100
	P·05 = 43				

An analysis of the green yields showed that treatments 2 and 3 did not differ significantly, but both were better than 1 and 4. The percentage nitrogen obtained

* Obtained from the United States Dept. of Agriculture.

from the composite samples and the total amounts of nitrogen calculated per row were considerably greater for treatment 2 than for other treatments. This is in agreement with observed differences at harvesting time when the darker green colour of the treatment 2 plants indicated a higher nitrogen content. In the last column of Table 1, the nitrogen yields are expressed as percentages of the control.

On 30/4/43 block 7, which was representative of all blocks at flowering time, was harvested for seed yields. The stage of maturity of different treatments varied somewhat at this time. Treatments 2 and 3 were mature, largely defoliated and the pods were ready for threshing. Treatment 1 still carried a few green pods, while the plants of treatment 4 were less mature. It was necessary to dry off any green pods in the sun for a few days before threshing.

Table 2 shows the seed weights.

Table 2.

SOYBEAN SEED WEIGHTS.

Block.	Treatment.	Seed Weights.				
		Per Row.		Per Acre.	Per Acre.	%
		lbs.	ozs.	lbs.	bushels.	
7	1	1	11	844	14	108
7	2	2	10	1,325	22	168
7	3	1	14	938	16	120
7	4	1	9	781	13	100

The seed yields strongly support the evidence already presented—that treatment 2 is superior to all the others. The weight of seed harvested per row was considerably greater from treatment 2 than from the remainder, being the equivalent of 22 bushels per acre compared with 13 bushels for the control. The yields are compared on a percentage basis in the last column. It is interesting to note that the high nitrogen content in treatment 2 in the green stage is reflected in the high seed yields in that treatment, but the percentage nitrogen of the seed is only slightly higher than that of the "control" seed. (See seed analysis.)

Under the conditions of the above experiment, the strain of bacteria used in treatment 2 gave the most satisfactory results. This conclusion is drawn from the following observational and experimental evidence:—

1. At flowering time growth of these plants was generally more satisfactory and in particular the foliage colour was a conspicuous dark green which contrasted with that in the other treatments.
2. The percentage nitrogen was higher.
3. The amount of nitrogen per row was higher.
4. The seed yield was higher.

SOYBEAN SEED ANALYSIS.

As no analyses have been done previously on locally grown soybean seed, the opportunity was taken of using, for this purpose, some of the seed harvested in

the above experiment. Two samples were taken, viz., one from treatment 2 and one from treatment 4 (control) and the results are presented below.

	Treatment 2.	Treatment 4.
	%	%
Moisture (dried at 98°C)	11.56	11.62
Total Ash	5.87	5.86
Total Nitrogen (reported as N)	6.86	6.77
Calcium (Ca)	0.15	0.18
Phosphate (P_2O_5)	0.95	1.37
Potash (K_2O)	2.52	2.53

All figures on dry basis.

ACKNOWLEDGMENTS.

Statistical analysis of the results, and chemical analyses, were respectively carried out by the Deputy Conservator of Forests, and the Government Analyst, to whom the authors' thanks are given. Grateful acknowledgment is also given to Messrs. Coverley Bros., of Jandakot, who made available and prepared the land used in the experiment.

Apple Storage Experiments—Effect of Skin Coatings.

Report on Common Storage Experiment Carried Out at Perth during 1943 Season.

TREATMENT OF GRANNY SMITH APPLES WITH CASTOR OIL-SHELLAC SOLUTION.

T. C. MILLER, Horticultural Adviser.

Following work carried out in the Eastern States in previous years, an experiment was carried out in Western Australia this year by the coating of 1500 loose cases of Granny Smith apples with an alcoholic solution of castor oil and shellac, the intention being to ascertain to what extent the success obtained in the Eastern States, using the method followed, will apply to the Granny Smith variety under conditions ruling in this State. The fruit was processed at the Murray Street depot of the Apple and Pear Marketing Board, and held in common store at the same premises.

The solution used for treating the fruit was a four in one mixture of castor oil and dewaxed shellac made up into a 10 per cent. solution with 95 per cent. alcohol. This solution was quite mobile and drained freely from the dipped fruit which dried out in about an hour, and a thin coating of the oil and shellac remained on each apple. Once dry the film of oil is scarcely noticeable in appearance and gives very little if any taste to the fruit.

The procedure adopted was as follows:—

Twenty-five open slatted white wood picking boxes were used for dipping and the fruit was transferred to these as gently as possible. This was performed when the apples were in dump cases by placing the dipping box right over the opened case, inverting both together, and simply withdrawing the case. When the fruit was provided in white wood picking boxes it was more difficult to transfer the

fruit carefully, but this was carried out by placing the dipping box on top of the open end of the picking case, carefully tipping the two together until both lay on the ground, then raising the picking box to an angle of about thirty degrees while holding both boxes firmly together. At this angle most of the fruit passed gently down into the dipping box and on slowly continuing the movement until the picking box was inverted, the few remaining apples rolled into the lower box.

The solution was contained in a galvanised iron tank of approximately 20 gallons capacity and one case was dipped at a time, by simply lowering it into the solution until all apples were immersed and immediately withdrawing it and holding it over the tank for 10 seconds to drain. After dipping, the boxes were placed to drain further on a set of rollers over a corrugated iron draining table, where they remained for several minutes, then the apples were tipped gently into a hopper where they were sorted and transferred to cases to be stored. A minimum time of two hours was allowed for fruit to dry out properly after sorting, as stacking before being quite dry has a deleterious effect on the keeping quality of the fruit. The solution from the corrugated iron table drained back into the dipping tank, and the alcoholic solution was maintained at constant strength by periodically adding alcohol to make up for evaporation.

STORAGE CONDITIONS.

The fruit was stored in a corner of the shed, one quarter being closely stacked, and the remainder slatted and well ventilated. No thermograph was available to install with the fruit, but temperatures were obtained from the Meteorological Bureau which is close to the store (see table 1). The fruit was obtained partly from Karragullen and partly from Donnybrook.

TABLE 1.

TEMPERATURES AT PERTH, 1943.

Week Ending.	Weekly. Maximum. °F	Weekly. Minimum. °F	Weekly. Mean. °F	Monthly. Mean. °F
May 7	79	46	62	
„ 14	78	42	59	
„ 21	81	47	61	59
„ 28	71	44	57	
June 4	72	42	57	
„ 11	76	47	58	
„ 18	66	41	54	57
„ 25	69	44	56	
July 2	69	50	58	
„ 9	66	41	53	
„ 16	64	43	53	53
„ 23	64	38	53	
„ 30	67	36	52	
Aug. 6	63	41	52	
„ 13	69	43	55	
„ 20	66	44	54	54
„ 27	73	44	55	
Sept. 3	68	42	54	
„ 10	70	45	58	
„ 17	70	46	57	57
„ 24	68	41	55	
Oct. 1	77	44	53	

RESULTS.

The first line to be treated was picked during the first week in May and held in the depot until May 18th, when dipping commenced. Subsequent lots of fruit to be treated were picked during the middle of May and towards the end of that month. The treatment was carried on with short interruptions and finished on the 1st June. In general, the condition of the fruit treated was not very satisfactory, and that treated during the last few days was rather mature and some of it quite yellow. Bruises and blemishes were prevalent throughout.

The first inspection of the fruit took place on 2nd July, a month after dipping was completed, and at that time all lines were holding well, and seemed to have matured only very little since treatment, while the untreated controls had yellowed appreciably. No sign of undesirable flavours was apparent. Breakdown, due to bruising, and some rots which had commenced before treatment, were retarded by the action of the solution.

Two weeks later on 16th July, it was observed that there was a tendency of a change in flavour. The typical Granny Smith flavour was not longer present, although no distinct off flavours had developed. The fruit was still crisp, green and juicy, but actually the controls possessed a fuller and better flavour, and were still in good condition.

On the 6th August considerable time was spent in inspecting, sectioning and tasting the apples in various conditions found in the stack. In general, although the good colour of the fruit had been maintained, wilting had been almost eliminated, and it still appeared to be in prime condition. Alcoholic and breakdown flavours had commenced to appear. At this date, the controls were very yellow, wilting had commenced, and there were signs of internal breakdown in sizes of 3-inch and over. The smaller sizes were, however, much superior in flavour to any of the treated fruit.

Flavours apparent in the treated fruit at this period could be placed roughly into four classes, viz.:—

1. Fruit which was very much over-mature for processing at the time of dipping, and which was suffering from suffocation of the tissues, and showing distinct signs of breakdown and browning of the internal tissues. The flavour was typical of that of fruit which is commencing to breakdown. It is presumed that the reason for this condition is the fact that the fruit had reached an advanced stage of maturity when processed, and that the carbon dioxide forming in the fruit had been prevented from escaping by the film of oil and shellac, leading to suffocation and degeneration of the tissue.

2. Fruit which was apparently at the optimum stage of maturity for processing, and which appeared at that time to be a little yellow, but which had maintained its condition up to 6th August, and no undesirable flavours had developed. With regard to this type it is pointed out that this fruit was then quite yellow, no breakdown had commenced, but there was no flavour typical of the variety.

3. Fruit which was green at the time of processing, and which, without developing any undesirable flavour, had what may be termed a grassy taste.

4. Fruit which was green when processed, and which had since developed distinct alcoholic flavours.

The reason for the flavours developed in the 3rd and 4th classes is presumably that during the process of ripening, insufficient oxygen had been able to enter the skin, partly due to lack of ventilation in the stack, and partly to too thick a coating of oil shellac on the surface, causing anaerobic respiration to set in with a consequent production of alcohols and alcoholic flavours. It may be noted that some of these apples in class 4 had a distinct pineapple taste. Most apples of the large sizes, 3in. and over, showed traces of development of core flush at this time.

The browning of the tissue commencing from the core and spreading outwards (core flush) was slightly more prevalent in the treated than untreated fruit, and followed the incidence of the distinct alcoholic flavour and over maturity.

Following on this report, it was decided to pick over and pack out the treated lines. Seen on the bench, although there was considerable variation from very green to very yellow, by far the greater part of the fruit appeared well coloured and prime. It must be remembered that the original fruit at the time of treating consisted of very mixed grades and colours. Off flavours at this time were apparently not noticeable enough to affect to any extent the market value of the line. A report received from the Marketing Officer of the Apple and Pear Board at this period reads as follows—

Total waxed, 1448 (loose bushels).

Total Packed (All grades)	795 cases
Rejects in packing above	191 „
Rots (Tipped)	86 „
Held in store for further experiment ..	122 G. Smith
	1 Demo.

Note: Eighty-six cases were tipped but if fruit had been in sound condition it would have equalled approximately 150 cases.

The fruit held in store for further experiment was ultimately tipped on October 1st.

The sales of these apples were at Board rates, compatible with Board prices as at the time of sale.

The above fruit when packed was at its final stage for keeping, therefore the reason for packing and marketing. Fruit was showing internal breakdown in the larger sizes. No comments were passed by the general public in regard to any tastes or breakdown.

GENERAL REMARKS.

1. The cost of treatment (labour and materials) per packed case at the end of storage period was approximately 2s.

2. The maximum useful storage period was 12 weeks.

3. Better results should be obtained by treating a uniform line of fruit of 2½in. and 2¾in. sizes about two weeks earlier and immediately after picking.

4. Less mature fruit coated with a slightly weaker mixture may be more suitable for Western Australian conditions, and should hold longer in common store.

Erratum.

Jnl. Dept. Agric., W.A., Vol. 20, No. 1, page 4, last line—0.4 should read 0.24 per cent. P_2O_5.

The Official Australian Pure Bred Dairy Cattle Production Recording Scheme.

WESTERN AUSTRALIAN RESULTS.

M. Cullity, Superintendent of Dairying; B. H. Drakes, Recording Officer.

Farmers are accustomed to look forward to the publication each year of the production figures of the pure-bred herds, in order to study the results achieved by the breeders. In this State, owing to the educational effect of the Dairy Cattle Improvement Act and other activities, the proportion of bulls in use which are pure-bred is over 70 per cent. A large proportion of these are "standard" bulls, being the progeny of cows which have been tested and have given more than the standard for the age at testing. The owners of commercial herds therefore have a keen appreciation of the value of testing and the need for prepotent sires from high producing blood lines if the quality of their herds is to be improved. The failure of stud breeders over a period of years to achieve any substantial improvement in the production of their herds is disappointing, while the success achieved by numbers of commercial dairymen in obtaining average productions in their herds surpassing those of many pure-bred herds is a direct and forcible challenge to breeders who aspire to supply herd sires for these grade herds.

A new approach in this matter is needed, otherwise the value of the pure-bred herds will be discounted to such an extent that retrogression will set in. It is apparent from a study of the results year by year, that too many poor quality females are reared. This suggests that the herd sires have not been up to quality. If this is the case, endeavours must be made to organise a system whereby an earlier appreciation of the value of each bull may be obtained. The tabulation of the performances of all tested cows according to their sires would provide basic information regarding the probable success or failure of all new bulls. It is hoped that a start will be made with the tabulation of this information soon after the cessation of hostilities.

The average production of pure-bred cows under test is shown in Table 1.

Table I.

AVERAGE PRODUCTION OF PURE-BRED COWS UNDER OFFICIAL TEST.

Year.	Number of Cows Completing Test.	Average Butter-fat per Cow.
		lbs.
1934–35	305	320·26
1935–36	367	297·17
1936–37	319	300·87
1937–38	333	298·08
1938–39	375	292·40
1939–40	382	305·88
1940–41	372	298·38
1941–42	290	322·84
1942–43	294	321·27

It will be noted that the average for the year is only 1.57 lbs. below the record production of 1941-42 and therefore can be regarded as satisfactory in view of the unsettled conditions and difficulties of war time.

A total of 315 cows in 21 herds were tested during the year and of these 21 were withdrawn before they were tested for 150 days, leaving 294 to be included in the averages. A number were withdrawn from test after the 150 days, but before the completion of a full lactation period.

The percentage of cows passing the standard declined slightly from the previous year, although better than in earlier years. The details are shown in Tables 2 and 3.

TABLE II.

PERCENTAGE OF COWS PASSING STANDARD.

Year.	A.I.S.	Guernsey.	Jersey.	Total.
1942–43	67·6	67·9	55·0	64·3
1941–42	73·1	68·3	59·7	68·3
1940–41	52·0	61·0	51·0	54·0
1939–40	48·0	77·5	64·2	59·2
1938–39	53·8	71·4	55·2	57·9
1937–38	59·1	68·7	35·6	53·1

The bulk of the withdrawals referred to above were Jerseys and therefore the fall in the percentage passing the standard is probably higher than would have been the case had misfortune not been encountered in one herd.

TABLE III.

COWS PASSING STANDARD.

Age Class.	A.I.S.		Guernsey.		Jersey.		All Breeds.	
	No. of Cows. Tested.	No. Passing. Standard.	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.
Mature	41	24	27	17	22	5	90	46
Senior, 4 years	6	4	5	3	4	3	15	10
Junior, 4 years	16	10	6	6	3	3	25	19
Senior, 3 years	8	7	5	3	7	4	20	14
Junior, 3 years	18	12	6	4	8	6	32	22
Senior, 2 years	18	8	2	1	14	8	34	17
Junior, 2 years	35	31	21	15	22	15	78	61
Totals	142	96	72	49	80	44	294	189
Percentage Passing Standard	67·6		67·9		55·0		64·3	

The effect of the withdrawals of these cows from test before the completion of the full period can be seen plainly in the mature class of the Jerseys, where only five of the 22 cows whose figures were included, passed the standard.

One very pleasing feature of this table is the relative success achieved by the junior two-year old heifers. In this class 61 of a total of 78 tested passed the

standard. It will be noted with interest also that the productions of both the junior and senior two-year classes of Jerseys were better than both the Shorthorns and Guernseys. (See Table 4.) This may indicate greatly improved performances from this breed in future years.

Table IV.

AVERAGE BUTTER-FAT PRODUCTION IN EACH CLASS.

Age Class.	Standard.	A.I.S.		Guernsey.		Jersey.		All Breeds.	
		No. of Cows.	Average Butter-fat.	No. of Cows.	Average Butter-fat.	No. of Cows.	Average Butter-fat.	No. of Cows.	Average Butter-fat.
	lbs.		lbs.		lbs.		lbs.		lbs.
Mature	350	41	378·81	27	396·64	22	268·41	90	356·19
Senior, 4 years	330	6	356·42	4	347·23	4	356·42	15	355·37
Junior, 4 years	310	16	335·43	6	415·82	3	376·66	25	359·67
Senior, 3 years	290	8	354·10	5	293·46	7	338·43	20	333·46
Junior, 3 years	270	18	308·60	6	431·55	8	415·50	32	312·76
Senior, 2 years	250	18	290·21	2	279·42	14	321·65	34	302·52
Junior, 2 years	230	35	276·72	21	250·40	22	280·37	78	270·66

A perusal of this table shows that the Jersey mature class, discussed earlier, was the only one which did not exceed the standard. New records were established during the year.

Senior Three-year old Class.

"Juadine Peerless Lily 13th" (Jersey) owned by Miss L. G. Hancock, of Harvey, produced 10,364 lbs. of milk, 6.25 per cent. average test and 648.60 lbs. of butter-fat in 273 days.

This established records for:—

1. All breeds, Senior three-year olds.
2. Jersey, Senior three-year olds.
3. W.A. Bred, Senior three-year olds.

Junior Two-year old Class.

"Juadine Queen" (Jersey) owned by Miss L. G. Hancock of Harvey, produced 6,789 lbs. of milk, 6.21 per cent. average test and 421.64 lbs. of butter-fat in 273 days, which is a record for Jerseys in this class.

"Juadine Peerless Lily 13th" and "Juadine Queen" are by the imported bull "Austral Park Wonderful Standard" which proved to be the leading sire for the season.

AVERAGE PRODUCTION OF DAUGHTERS OF SIX HERD SIRES.

Name of Bull.	Sire.	Dam.	Average Production of Six Best Daughters.		No. of Daughters.	Average Production.	
			Without Allowances.	With Allowances.		Without Allowances.	With Allowances.
			lbs. butter-fat.	lbs. butter-fat.		lbs. butter-fat.	lbs. butter-fat.
Austral Park Wonderful Standard (12423)	Ellerdale Wonderful Masterman (11561)	Ellerdale Wonder's Golden (47992)	447·89	533·49	7	430·38	516·76
Blacklands Jean's Supreme (1871)	Fussy's Monarch of Hillview (493) (I.M.S.H.B.)	Jean 7th of Blacklands (7425) (I.M.S.H.B.)	494·28	513·73	15	378·38	420·74
Koojan Golden Prosper (2283)	Koojan Golden Governor (595)	Koojan Bonnie Jean (1612)	494·44	502·72	12	425·00	435·91
Parkview Guardian (2557)	Parkview Guardsman (183)	Parkview Eva 12th (1157)	454·30	476·12	15	389·39	415·91
Grass Vale Gold Boy (14684)	Belgonia Gold Boy (12458)	Grass Vale Lady Fowler 17th (48536)	411·68	468·89	14	357·54	435·60
Parkview Commodore (306)	Jean's Monarch of Blacklands (869) (I.M.S.H.B.)	Mayflower 9th of Parkview (8065) (I.M.S.H.B.)	425·17	443·48	11	371·19	398·67

TABLE VI.

COWS WHICH COMPLETED TEST DURING THE TWELVE MONTHS ENDED 30TH JUNE, 1943.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk for Period.	Average Test.	Weight of Butter Fat for Period.	Owner.	Sire.
						lb.	lb.	%	lb.		
COWS UNDER 2½ YEARS—STANDARD 230 LB. BUTTER-FAT.											
Wallatin Fairy 3rd	A.I.S.	....	17-5-40	5-5-42	273	40	11,370	3·88	441·83	B. W. Prowse	Summerlea Pioneer
Juadine Queen	Jersey	....	20-5-40	25-8-42	273	18	6,789	6·21	421·64	Miss L. G. Hancock	Austral Park Wonderful Standard (12423)
Camden Ariadne	do.	....	10-8-40	19-7-42	273	13·5	5,815	6·65	386·93	C. E. Kruger	Greenmount Golden Sultan (14688)
Denmark Golden Valencia 2nd	Guernsey	8535	15-9-39	10-11-41	273	14	6,672	5·78	385·81	Denmark Research Station	Koojan Ace's Goldseeker (3431)
Denmark Golden Valencia	do.	8534	15-9-39	28-2-42	273	19	7,242	5·16	374·37	Denmark Research Station	Koojan Ace's Goldseeker (3431)
Wooroloo Golden Girl	A.I.S.	....	27-6-39	20-10-41	273	26	8,718	4·06	354·64	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Camden Diana	Jersey	....	10-9-40	27-7-42	273	15·5	6,466	5·44	352·14	C. E. Kruger	Greenmount Golden Sultan (14688)
Grass Vale Silvermine	do.	....	6-11-40	13-9-42	273	15	5,505	6·26	344·90	R. H. Rose	Grass Vale Gold Boy (14684)
Grass Vale Magnolia	do.	....	29-6-39	28-11-41	273	22	6,936	4·93	342·46	R. H. Rose	Grass Vale Gold Boy (14684)
Koojan Golden Jewel	Guernsey	....	12-3-40	3-8-42	273	18	6,894	4·91	338·68	A. W. Padbury	Koojan Beau Ideal
Denmark Anna	do.	....	24-9-39	7-11-41	273	20	5,790	5·80	336·20	Denmark Research Station	Koojan Ace's Goldseeker (3431)
Glanavon Girl 4th	A.I.S.	....	10-11-39	12-4-42	273	25	8,775	3·81	334·84	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Glanavon Topsy	do.	....	27-9-39	16-3-42	273	22	8,376	3·96	331·93	D. Bevan & Sons	Tipperary President (5335)
Glanavon Daphne 5th	do.	....	12-4-39	9-10-41	240	26	6,900	4·79	331·11	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Juadine Julienne	Jersey	....	2-3-40	28-8-42	273	13·5	6,385	5·13	327·90	Miss L. G. Hancock	Austral Park Wonderful Standard (12423)
Claremont Poppy 19th	A.I.S.	....	8-7-40	27-9-42	273	27	7,791	4·18	325·72	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Juadine Peerless Lily 17th	Jersey	....	18-12-39	28-4-42	273	15	5,175	6·28	325·30	Miss L. G. Hancock	Austral Park Wonderful Standard
Grass Vale Lady Fowler 31st	do.	....	17-8-40	6-9-42	273	17	5,871	5·46	320·84	R. H. Rose	Grass Vale Gold Boy (14684)
Wooroloo Lilac 2nd	A.I.S.	....	18-12-39	17-6-42	273	19	7,647	4·16	318·25	Wooroloo Sanatorium Farm	Wooroloo Triumph's Heir
Glanavon Maggie	do.	....	7-8-39	6-2-42	273	27	8,031	3·94	317·15	D. Bevan & Sons	Tipperary President (5335)
Wallatin Queen Regent	do.	....	4-5-40	7-5-42	273	22·5	7,727	4·02	310·92	B. W. Prowse	Summerlea Pioneer
Travalgan Lady Elon 7th	Jersey	....	22-6-40	16-6-42	273	15	5,565	5·51	306·69	W. H. & T. F. Robinson	Travalgan Northern Airman (13312)
Grass Vale Golden Cream 22nd	do.	....	18-6-40	18-8-42	273	13	5,049	6·02	304·22	R. H. Rose	Grass Vale Gold Boy (14684)
Travalgan Starbright 13th	do.	....	6-6-40	12-6-42	273	15	5,475	5·51	302·17	W. H. & T. F. Robinson	Travalgan Northern Airman (13312)
Wooroloo Dawn 2nd	A.I.S.	....	9-10-39	8-4-42	273	19	6,777	4·40	298·43	Wooroloo Sanatorium Farm	Wooroloo Red Lad (5418)
Yanget Show Girl	do.	....	20-1-40	30-4-42	273	23·5	7,270	4·10	298·34	B. W. Prowse	Leylands Defiance (2380)
Brookfields Glorion	Guernsey	8384	2-2-40	15-3-42	273	17·5	5,122	5·81	297·77	P. G. Hampshire & Son	Brookfields Baron (3936)
Grass Vale Golden Maggie....	Jersey	....	5-10-39	13-10-41	273	18	5,754	5·13	295·47	R. H. Rose	Grass Vale Gold Boy (14684)

Glanavon Gwen	A.I.S		21-7-40	15-9-42	273	23	6,759	4·25	287·62	D. Bevan & Sons	Parkview Commodore (306)
Travalgan Starbright 9th	Jersey	....	23-5-40	7-6-42	273	15	5,115	5·59	286·02	W. H. & T. F. Robinson	Travalgan Northern Airman (13312)
Koojan Ideal's Pixie	Guernsey	813	10-9-39	28-1-42	273	14	4,812	5·88	283·06	A. W. Padbury	Glenburnie Ideal (Imp.) (2548)
Claremont Mable 18th	A.I.S.	....	15-4-40	2-10-42	273	25	6,975	4·04	282·10	Claremont Hospital for Insane	Wooroloo Jean 2nd's Guardian (4488)
Wooroloo Sunlady 2nd	do.	....	25-3-40	9-4-42	273	19	6,207	4·53	281·66	Wooroloo Sanatorium Farm	Wooroloo Red Lad (5418)
Maxwell Queen Ann	Guernsey	....	29-5-40	15-9-42	273	11	4,173	6·63	277·01	P. Berridge	Moongi Oliver (1495)
Tipperary Maggie 7th	A.I.S.	....	22-8-40	8-8-42	273	12	6,816	4·04	275·88	W. G. Burges	Liberton Venturer
Glanavon Rosina 4th	do.	....	24-9-40	18-8-42	273	20	7,260	3·76	273·51	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Claremont Maggie Morrison 39th	do.	....	5-7-40	30-9-42	273	26	6,618	4·10	271·55	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Brookfields Queen 8th	Guernsey	....	21-8-40	29-9-42	273	16	5,868	4·61	270·72	P. G. Hampshire & Son	Yarraview Clarinette
Claremont Maggie Morrison 36th	A.I.S.	....	24-2-40	11-8-42	273	24	6,462	4·17	269·97	Claremont Hospital for Insane	Westby Monarch (5404)
Lansdowne Jocelyn	Guernsey	....	15-7-40	1-10-42	273	12	5,256	5·09	267·70	A. W. Padbury	Koojan Beau Ideal
Claremont Treasure 22nd	A.I.S.	....	25-6-40	26-9-42	273	24	7,062	3·78	267·37	Claremont Hospital for Insane	Wooroloo Triumph (3627)
Lenmoors Queen	do.	....	27-8-39	5-11-41	273	24	6,882	3·87	266·64	G. W. Marston	Longridge Blanche's Emblem (3344)
Claremont Poppy 18th	do.	....	26-1-40	16-6-42	273	18	6,324	4·19	265·49	Claremont Hospital for Insane	Westby Monarch (5404)
Glanavon Daphne 6th	do.	....	1-3-40	19-4-42	273	14	6,642	3·94	262·03	D. Bevan & Sons	Glanavon Franklyn (4829)
Claremont Clara 15th	do.	....	28-5-40	12-9-42	273	21	6,093	4·29	261·56	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Tipperary Dove 14th	do.	....	22-3-40	19-4-42	273	12	6,216	4·19	260·69	W. G. Burges	Liberton Venturer
Wooroloo Dainty 4th	do.	....	1-1-40	30-4-42	273	11	5,883	4·41	259·87	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Grass Vale Golden Cream 23rd	Jersey	....	2-8-40	19-9-42	273	11	4,413	5·84	257·99	R. H. Rose	Grass Vale Gold Boy (14684)
Denmark Golden Dawn 2nd	Guernsey	8527	2-4-40	15-8-42	273	8·5	4,330	5·94	257·35	Denmark Research Station	Koojan Ace's Goldseeker
Lansdowne Lady	do.	....	3-7-40	13-9-42	273	11·5	4,969	5·14	255·64	A. W. Padbury	Koojan Beau Ideal
Claremont Biddy 52nd	A.I.S.	....	10-6-40	18-9-42	273	27	6,591	3·83	252·77	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Claremont Star 22nd	do.	....	1-5-40	29-8-42	273	18	6,234	4·04	252·07	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Claremont Pinafore 12th	do.	....	25-7-40	29-9-42	273	18	6,534	3·84	251·35	Claremont Hospital for Insane	Westby Monarch (5404)
Travalgan Lady Eion 8th	Jersey	....	19-9-40	16-6-42	273	13	4,809	5·18	249·21	W. H. & T. F. Robinson	Glen Iris Golden Oxford (12694)
Brookfields Bonny	Guernsey	8378	3-3-40	8-5-42	273	16	4,803	5·17	248·79	P. G. Hampshire & Son	Yarraview Clarinette 2nd (4629)
Muresk Delicia	do.	....	15-5-40	7-6-42	273	13	5,259	4·48	246·76	Muresk Agricultural College	Denmark Damon
Claremont Maggie Morrison 38th	A.I.S.	....	7-6-40	6-9-42	273	24	6,492	3·77	245·30	Claremont Hospital for Insane	Claremont Max Hero (3802)
Thornlie Pearl's Idyll	Guernsey	9508	26-1-40	4-4-42	273	18	4,734	5·16	244·72	P. G. Hampshire & Son	Pleasant Hill Prince (4414)
Claremont Beauty 18th	A.I.S.	....	30-1-40	11-6-42	273	17	5,541	4·38	243·18	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Claremont Treasure 20th	do.	....	20-5-39	16-10-41	273	19	6,147	3·85	237·06	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Lansdowne Cream Lady	Guernsey	8826	3-10-39	22-10-41	273	11	4,323	5·47	236·77	P. G. Hampshire & Son	Koojan Ideal's Benefactor (4165)
Tipperary Beauty 11th	A.I.S.	....	20-9-40	1-8-42	273	9	5,727	4·01	229·66	W. G. Burges	Liberton Venturer
Grantham Easter Fairy 2nd	Jersey	....	22-5-40	30-10-41	240	12·5	3,960	5·50	217·83	J. A. Sears	Grantham Easter Oxford (14677)

HERD TESTING—*continued*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk for Period.	Average Test.	Weight of Butter Fat for Period.	Owner.	Sire.
COWS UNDER 2½ YEARS—STANDARD 230 LB. BUTTER-FAT—*continued*.											
						lb.	lb.	%	lb.		
Claremont Whitby Maid 40th	A.I.S.	....	28–5–40	4–9–42	273	12	5,271	4·10	216·34	Claremont Hospital for Insane	Westby Monarch (5404)
Crantock Starbright's Reminder	Jersey	....	21–6–40	20–7–42	240	6	3,660	5·73	209·91	Mrs. G. H. Burnside	Crantock Starbright's Airman (15491)
Crantock Noble Bell	do.	....	11–8–40	11–9–42	240	8	3,840	5·25	201·66	Mrs. G. H. Burnside	Crantock Emminent's Noble (17405)
Muresk Rose Petal	Guernsey	....	13–1–40	22–5–42	273	7	3,951	5·00	197·70	Muresk Agricultural College	Muresk Homestead
Hopelands Northern Helena	Jersey	....	7–10–39	9–6–42	240	11	3,690	5·30	195·84	A. G. Scott	Travalgan Northern Noble (10124)
Grass Vale Silver Eve	do.	....	1–9–40	6–9–42	150	20	3,810	5·01	190·96	R. H. Rose	Clarendon Eyre Bing Boy 4th
Glanavon Melba 3rd	A.I.S.	....	11–11–40	20–9–42	273	9	4,167	4·27	178·27	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Grass Vale Lady Fowler 30th	Jersey	....	22–5–40	4–10–42	180	9	3,030	5·63	170·66	R. H. Rose	Grass Vale Gold Boy (14684)
Glanavon Ettie 3rd	A.I.S.	....	19–10–40	23–10–42	120	27	3.930	4·17	164·16	D. Bevan & Sons	Parkview Commodore (306)
Thornlie Lady May	Guernsey	....	16–11–39	4–11–41	180	11	3,330	4·91	163·68	R. J. Giles	Warrawong Wonder (4536)
Brookfield's Julia	do.	....	18–3–40	11–7–42	180	20	3,360	4·66	156·63	P. G. Hampshire & Son	Brookfields Baron
Maxwell Red Rose	do.	....	23–6–40	7–10–42	150	10	2,880	5·40	155·79	P. Berridge	Moongi Oliver (1495)
Lenmoors Milkmaid 2nd	A.I.S.	....	20–10–40	19–10–42	120	24	3,735	4·05	151·38	G. W. Marston	Lenmoors Gem (4977)
Denmark Briarette	Guernsey	....	24–9–40	31–7–42	273	5	2,715	5·08	138·21	Denmark Research Station	Koojan Ideal's Dictator
Glanavon Empress 4th	A.I.S.	....	24–7–40	1–9–42	150	10	2,820	4·61	130·08	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Denmark Jonquil	Guernsey	....	24–4–40	24–7–42	273	5	2,370	5·27	125·03	Denmark Research Station	Denmark Beau Ideal (4779)
Glanavon Sunbeam 15th	A.I.S.	....	30–10–40	18–10–42	120	15	2,520	3·95	99·63	D. Bevan & Sons	Parkview Commodore (306)
Lenmoors Joan 2nd	do.	....	5–8–40	25–11–42	90	21	2,310	3·85	89·10	G. W. Marston	Lenmoors Gem (4977)
Hopelands Master Belle	Jersey	....	18–8–40	12–11–42	90	6·5	1,095	5·13	56·28	A. G. Scott	Travalgan Northern Noble (10124)
Hopelands Jean	do.	....	19–9–40	3–11–42	90	14	1,800	3·08	55·56	A. G. Scott	Travalgan Northern Noble (10124)
Tipperary Dove 15th	A.I.S.	....	14–4–40	4–5–42	60	13	1,110	4·43	49·20	W. G. Burges	Liberton Venturer
Glanavon Nancy 5th	do.	....	29–12–40	20–10–42	30	37	1,110	4·11	45·69	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Tipperary Lovely 4th	do.	....	29–6–40	12–8–42	30	31	930	4·27	39·78	W. G. Burges	Blacklands Monarch's Commander
Glanavon Florrie 2nd	do.	...	4–5–40	17–10–42	30	31	930	4·25	39·54	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
COWS 2½ YEARS AND UNDER 3 YEARS STANDARD 250 Lbs. BUTTER-FAT.											
Camden Circe	Jersey	....	24–9–39	6–7–42	273	19	7,047	6·36	448·48	C. E. Kruger	Greenmount Golden Sultan (14688)
Capel Rosemay	A.I.S.	....	21–10–39	4–5–42	273	37	11,036	3·94	435·06	B. W. Prowse	Capel Star King (4672)
Juadine Sparkle's Achievement	Jersey	....	27–9–39	26–8–42	273	20	8,295	4·90	406·62	Miss L. G. Hancock	Austral Park Wonderful Standard (12423)
Wooroloo Faith	A.I.S.	....	10–1–39	14–12–41	273	28·5	9,040	4·35	393·38	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Camden Beauty	Jersey	....	9–9–39	8–7–42	273	13	6,144	6·36	390·78	C. E. Kruger	Greenmount Golden Sultan (14688)
Grass Vale Buttercup 7th	do.	....	9–9–39	6–8–42	273	20	6,870	5·43	373·64	R. H. Rose	Grass Vale Gold Boy (14684)
Juadine Peerless Lily 16th	do.	....	20–9–39	24–4–42	273	21·5	6,544	5·69	372·91	Miss L. G. Hancock	Austral Park Wonderful Standard (12423)
Glanavon Glenys	A.I.S.	....	14–10–39	1–9–42	273	27	9,171	4·05	372·32	D. Bevan & Sons	Tipperary President (5335)

Wooroloo Netta 2nd	do.	....	6-10-39	15-5-42	273	26	9,078	4·06	369·00	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Wooroloo Bess	do.	23231	16-5-39	17-3-42	273	29	8,997	4·08	367·64	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Camden Arachne	Jersey	....	9-9-39	6-7-42	273	14	5,997	6·12	367·10	C. E. Kruger	Greenmount Golden Sultan (14688)
Grass Vale Lady Fowler 28th	Jersey	....	8-10-39	27-7-42	273	18	5,934	6·06	359·78	R. H. Rose	Grass Vale Gold Boy (14684)
Glanavon Dahlia 8th	A.I.S.	....	9-12-38	28-10-41	273	28	9,534	3·69	352·38	D. Bevan & Sons	Glanavon Franklyn (4829)
Grass Vale Golden Maggie....	Jersey	81629	5-10-39	26-9-42	273	17	6,306	5·52	348·52	R. H. Rose	Grass Vale Gold Boy (14684)
Brookfields Prudence	Guernsey	8389	13-1-40	1-9-42	273	15	5,280	6·18	326·44	P. G. Hampshire & Son	Yarraview Clarinette (4628)
Grass Vale Lady Fowler 29th	Jersey	....	9-9-39	26-8-42	273	16	5,898	5·44	321·03	R. H. Rose	Grass Vale Gold Boy (14684)
Glanavon Rose 2nd	A.I.S.	....	13-11-39	28-4-42	273	19	7,287	4·09	298·38	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Glanavon Pansy 5th	do.	....	13-6-39	29-4-42	273	18	7,704	3·86	298·05	D. Bevan & Sons	Glanavon Franklyn (4829)
Travalgan Starbright 8th	Jersey	79296	6-7-39	11-3-42	273	15	5,025	5·76	289·49	W. H. & T. F. Robinson	Glen Iris Golden Oxford (12694)
Glanavon Goldilocks	A.I.S.	....	7-6-39	16-2-42	273	**21**	7,593	3·79	288·19	D. Bevan & Sons	Glanavon Franklyn (4827)
Westby Lupin 18th	do.	....	27-9-39	25-4-42	273	**16**	6,288	4·29	270·12	Burkett & Brown	Westby Monarch (5404)
Glanavon Empress 3rd	do.	....	21-8-39	20-3-42	273	17	6,411	4·19	268·80	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Crantock Starbright Delphinium	Jersey	....	30-4-39	28-2-42	273	21	6,103	4·35	265·62	Mrs. G. H. Burnside	Congelin Eminent's Golden (13623)
Wooroloo Rare Gem 2nd	A.I.S.	....	22-4-39	27-3-42	273	9	6,447	4·10	264·36	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Travalgan Starbright 7th	Jersey	79295	25-5-39	27-4-42	273	12	4,821	5·35	258·40	W. H. & T. F. Robinson	Glen Iris Golden Oxford (12694)
Crantock Golden Juliet	do.	....	30-4-39	17-3-42	240	26	5,460	4·67	255·09	Mrs. G. H. Burnside	Congelin Eminent's Golden (13623)
Yanget Pretty Maid 4th	A.I.S.	....	7-10-39	30-6-42	240	9	6,000	4·13	247·80	W. G. Burges	Leylands Defiance (2380)
Wooroloo Fussy 2nd	do.	....	21-5-39	19-2-42	210	12	5,880	4·18	246·27	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Westby Dahlia 2nd	do.	....	26-8-39	29-4-42	273	18	6,504	3·73	243·18	Burkett & Brown	Westby Searchlight
Brookfields Queen 6th	Guernsey	8390	2-3-39	6-3-42	273	10	4,755	4·88	232·41	P. G. Hampshire & Son	Brookfields Baron (3936)
Claremont Blossom 32nd	A.I.S.	....	16-2-40	3-9-42	273	22	5,916	3·85	227·81	Claremont Hospital for Insane	Claremont Max Hero (3822)
Hopelands Silverbelle 4th	Jersey	....	4-5-39	16-12-41	273	12·5	4,634	4·45	206·64	A. G. Scott	Melrose Sultan (6930)
Travalgan Lady Eion 6th	do.	79293	19-8-39	1-8-42	180	20	4,290	4·50	193·07	W. H. & T. F. Robinson	Glen Iris Golden Oxford (12694)
Greenmount Milkmaid 3rd	do.	....	16-8-39	1-5-42	210	7	3,540	4·44	157·50	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Lenmoors Della	A.I.S.	....	7-7-39	20-3-42	210	8	3,592	3·92	141·03	G. W. Marston	Longridge Blanche's Emblem (3344)
Tipperary Maggie 6th	do.	....	17-7-39	21-4-42	150	11	2,955	4·73	140·04	W G. Burges	Wooroloo Melba's Triumph
Lenmoors Fancy	do.	....	23-7-39	1-4-42	120	31	3,945	3·09	122·04	G W. Marston	Longridge Blanche's Emblem (3344)

COWS 3 YEARS AND UNDER 3½ YEARS STANDARD 270 LBS OF BUTTER-FAT.

Glanavon Empress 2nd	do.	....	5-7-38	8-10-41	273	15	10,935	4·19	458·68	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Wooroloo Rosebud 3rd	do.	....	29-5-39	22-6-42	273	19	10,617	4·02	427 68	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Denmark Dame	Guernsey	6960	17-6-38	11-11-41	273	30·5	10,311	4·08	420·77	Denmark Research Station	Koojan Golden Prosper (2253)
Koojan Ideal's Bluebell	do.	8807	15-1-39	14-6-42	273	14	6,552	5·86	384·47	A. W. Padbury	Glenburnie Ideal (Imp.) (2548)
Glanavon Doris 7th	A.I.S.	....	2-12-38	26-5-42	273	20	9,570	4·00	383·10	D. Bevan & Sons	Glanavon Franklin (4829)
Glanavon Thelma 3rd	do.	....	25-1-39	5-4-42	273	15	9,795	3·84	377·05	D. Bevan & Sons	Parkview Commodore (306)
Grass Vale Buttercup 5th	Jersey	....	22-6-39	11-7-42	273	11	6,213	6·00	373·30	R. H. Rose	Grass Vale Gold Boy (14684)
Travalgan Lady Mint 8th	do.	79294	3-5-39	16-6-42	273	16	6,408	5·63	361·14	W. H. & T. F. Robinson	Glen Iris Golden Oxford (12694)
Tipperary Beauty 7th	A.I.S.	....	27-7-39	2-10-42	273	23	7,989	4·47	357·25	W. G. Burges	Wooroloo Melba's Triumph (4491)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk for Period.	Average Test.	Weight of Butter Fat for Period.	Owner.	Sire.
						lb.	lb.	%	lb.		
COWS 3 YEARS AND UNDER 3½ YEARS. STANDARD 270 LB. OF BUTTERFAT—*continued.*											
Tipperary Beauty 6th	A.I.S.	....	8–8–38	31–12–41	273	14	7,962	4·43	353·33	W. G. Burges ...	Newstead Tourist (3419)
Glanavon Doris 6th	do.	....	9–11–38	15–1–42	273	15	8,160	4·21	343·55	D. Bevan & Sons ...	Parkview Commodore (306)
Camden Patsy	Jersey	....	27–6–39	2–7–42	273	11	5,108	6·62	338·66	C. E. Kruger ...	Greenmount Golden Sultan (14688)
Glanavon Doris 8th	A.I.S.	....	4–12–38	9–2–42	273	16	8,058	4·00	322·37	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Wooroloo Joy 4th	do.	....	6–7–38	17–9–41	210	18	6,810	4·68	318·96	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Glanavon Nancy 2nd	do.	....	2–12–38	4–6–42	240	20	7,770	4·07	316·77	D. Bevan & Sons	Glanavon Franklyn (4829)
Crantock Starbright's Princess	Jersey	....	26–7–39	28–8–42	273	17	5,361	5·87	314·87	Mrs. G. H. Burnside	Crantock Starbright's Airman (15481)
Grantham Easter's Junette	do.	66775	20–6–38	5–12–41	210	24	6,563	4·50	295·92	J. A. Sears	Clarendon Eyre Oxford Pioneer (11484)
Claremont Blossom 31st	A.I.S.	....	4–2–40	14–8–42	273	23	7,389	3·86	285·88	Claremont Hospital for Insane	Westby Monarch (5404)
Muresk Angelica	Guernsey	9101	10–9–39	29–9–42	273	11	5,403	5·16	279·17	Muresk Agricultural College	Muresk Homestead (2075)
Claremont Cherry 17th	A.I.S.	....	18–1–39	8–6–42	273	18	6,774	4·00	270·27	Claremont Hospital for Insane	Wooroloo Triumph 4th (3627)
Grantham Air Lady 5th	Jersey	66771	29–5–38	25–11–41	210	23·5	5,100	5·16	263·64	J. A. Sears	Clarendon Eyre Oxford Pioneer (11484)
Glanavon Golden Girl 3rd	A.I.S.	....	18–9–38	28–11–41	240	11	7,575	3·47	262·98	D. Bevan & Sons	Parkview Commodore (306)
Hopelands Broken Belle	Jersey	81827	29–7–38	20–12–41	273	18	4,704	5·43	255·47	A. G. Scott	Melrose Sultan (6930)
Claremont Belle 24th	A.I.S.	....	12–6–39	13–8–42	273	17	6,186	4·08	252·66	Claremont Hospital for Insane	Wooroloo Jean 2nd's Guardian (4488)
Muresk Delia	Guernsey	9105	11–5–39	29–6–42	273	7	5,241	4·70	246·80	Muresk Agricultural College	Denmark Damon (2519)
Lenmoors Joan	A.I.S.	....	13–8–39	28–9–42	150	30	6,240	3·89	243·15	G. W. Marston	Longridge Blanche's Emblem (3344)
Claremont Maggie Morrison 33rd	do.	....	4–5–39	28–7–42	273	17	6,171	3·88	239·88	Claremont Hospital for Insane	Wooroloo Jean 2nd's Guardian (4488)
Lenmoors Milkmaid	do.	....	7–7–39	1–4–42	273	9	5,742	4·10	236·69	G. W. Marston	Longridge Blanche's Emblem (3344)
Claremont Mabel 14th	do	....	7–10–38	16–12–41	273	21	5,823	3·81	222·15	Claremont Hospital for Insane	Claremont Max Hero (3802)
Denmark Damon's Pekoe	Guernsey	8525	23–10–38	19–11–41	273	9	4,227	5·21	220·35	Denmark Research Station	Denmark Damon (2519)
Glanavon Melba 2nd	A.I.S.	....	16–4–42	21–4–42	120	35	4,710	3·83	180·48	D. Bevan & Sons	Glanavon Gold Boy (4830)
Denmark Velveteen	Guernsey	8541	24–7–39	18–9–42	30	35	1,050	4·42	46·50	Denmark Research Station	Koojan Ace's Goldseeker (3431)
COWS 3½ YEARS AND UNDER 4 YEARS STANDARD 290 LBS. BUTTER-FAT.											
Juadine Peerless Lily 13th	Jersey	76977	20–12–38	10–9–42	273	27·5	10,364	6·25	648·60	Miss L. G. Hancock	Austral Park Wonderful Standard (12423)
Juadine March Flower	do.	81988	5–3–39	30–9–42	273	27	9,786	5·20	509·66	Miss L. G. Hancock	Austral Park Wonderful Standard (12423)

Wooroloo Dainty 2nd	A.I.S	28634	17-2-38	7-12-41	273	35	11,625	4·21	490·20	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Brookfields Betty	Guernsey	6833	30-10-37	29-10-41	273	19·5	7,918	5·49	435·31	P. G. Hampshire & Son	Brookfields Majesty (3254)
Grass Vale Twylish Lady	Jersey	76604	14-10-38	3-8-42	273	24	7,107	5·70	405·29	R. H. Rose	Grass Vale Gold Boy (14684)
Wooroloo Heather 2nd	A.I.S.	28644	6-11-38	23-6-42	273	10	8,490	4·35	369·88	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Brackenhurst Queen	do.	....	15-10-38	27-5-42	273	22	9,276	3·93	365·35	G. W. Marston	Thornleigh Champagne (930)
Glanavon Dahlia 9th	do.	....	19-1-39	9-5-42	273	26	8,778	4·12	362·40	D. Bevan & Sons	Glanavon Gold Boy (4830)
Glanavon Buttercup 3rd	do.	....	17-9-38	27-8-42	273	22	9,276	3·85	357·66	D. Bevan & Sons	Glanavon Gold Boy (4830)
Koojan Ideal's Dulcie	Guernsey	8310	25-10-38	14-6-42	273	14	6,282	5·65	355·17	A. W. Padbury	Glenburnie Ideal (Imp.) (2548)
Wooroloo Doreen 2nd	A.I.S.	28637	8-4-38	13-1-42	273	16	8,478	4·13	350·77	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Denmark Velvet	Guernsey	8540	23-8-38	12-7-42	273	16	6,648	4·93	327·75	Denmark Research Station	Denmark Auric (3313)
Amy	do.	....	25-9-38	11-7-42	273	13	4,989	6·13	306·20	P. Berridge	Willie
Crantock Primula's Tulip	Jersey	70900	15-3-38	7-11-41	273	15	5,295	5·74	304·05	Mrs. G. H. Burnside	Congelin Eminent's Golden (13623)
Glanavon Rosina 2nd	A.I.S.	....	17-9-38	23-7-42	273	8	7,614	3·94	300·16	D. Bevan & Sons	Glanavon Gold Boy (4830)
Wooroloo Hope 2nd	do.	....	2-9-38	5-4-42	273	13	6,729	4·09	275·60	Wooroloo Sanatorium Farm	Triumph of Pine Creek
Brookfields Queen 4th	Guernsey	6841	22-3-38	24-11-41	273	18	5,184	4·80	249·06	P. G. Hampshire & Son	Brookfields Baron (3936)
Glanavon Rosette 4th	A.I.S.	....	11-3-39	28-9-42	180	26	6,390	3·69	236·40	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Crantock Cream Countess	Jersey	....	20-8-38	29-5-42	180	9	3,450	5·57	192·33	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Greenmount Marinora's Model 2nd	do.	76623	27-5-38	27-4-42	210	15	3,660	4·92	180·27	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Greenmount Marinora 4th	do.	76622	30-7-38	25-4-42	180	7	2,985	4·31	128·82	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Denmark Mary Rose	Guernsey	6966	7-7-38	18-1-42	150	6	1,980	6·13	121·56	Denmark Research Station	Denmark Auric (3313)
Hopelands Silverbelle 4th	Jersey	81828	4-5-39	10-12-42	60	22	1,350	4·70	63·54	A. G. Scott	Melrose Sultan (6930)

COWS 4 YEARS AND UNDER 4½ YEARS STANDARD 310 LBS. BUTTER-FAT.

Denmark Petal	Guernsey	....	4-10-37	29-11-41	273	11	7,983	6·58	525·95	Denmark Research Station	Koojan Golden Prosper (2283)
Grass Vale Golden Eve	Jersey	76601	23-6-38	8-7-42	273	19	8,022	5·77	462·88	R. H. Rose	Grass Vale Gold Boy (14684)
Glanavon Dahlia 7th	A.I.S.	....	23-3-38	5-9-42	273	21	10,998	4·06	447·01	D. Bevan & Sons	Glanavon Neptune
Glanavon Dell 4th	do.	....	23-3-38	23-7-42	273	17	11,061	3·92	433·86	D. Bevan & Sons	Glanavon Elliott (3955)
Denmark Golden Glory	Guernsey	6965	13-5-38	21-9-42	273	24	7,872	5·44	428·68	Denmark Research Station	Denmark Damon (2519)
Denmark Rosebud 2nd	do.	....	2-5-38	2-8-42	273	22	7,596	5·46	415·39	Denmark Research Station	Denmark Damon (2519)
Coogeley Jonquil	do.	6945	1-11-37	17-4-42	273	19	6,777	6·09	412·81	Denmark Research Station	Coogeley Judy's Goldmine (2621)
Wooroloo Jewel	A.I.S.	....	20-11-37	29-11-41	273	19	8,727	4·54	396·52	Wooroloo Sanatorium Farm	Wooroloo Duke 6th (3622)
Brookfields Honour	Guernsey	6836	8-9-37	13-3-42	273	23·5	6,925	5·67	393·17	P. G. Hampshire & Son	Koojan Ace's Majestic (2735)
Capel Daisy 2nd	A.I.S.	....	1-5-38	16-5-42	273	24·5	9,703	3·94	383·00	B. W. Prowse	Capel Lottie's Reward (3782)
Glanavon Picture 4th	do.	....	16-7-37	31-12-41	210	35	9,465	3·90	369·27	D. Bevan & Sons	Parkview Commodore (306)
Wooroloo Empress 2nd	do.	28639	24-11-37	21-3-42	273	21	8,943	4·08	365·76	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Poppy 4th ...	do.	28654	12-4-38	14-9-42	273	7	8,061	4·52	364·72	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Mary	do.	....	21-11-37	8-2-42	273	23	8,469	4·25	360·52	Wooroloo Sanatorium Farm	Parkview Guardian (2557)

HERD TESTING *continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk for Period.	Average Test.	Weight of Butter Fat for Period.	Owner.	Sire.
						lb.	lb.	%	lb.		
COWS 4 YEARS AND UNDER 4½ YEARS. STANDARD 310 LB. BUTTERFAT—*continued.*											
Travalgan Starbright 4th	Jersey	69418	26–10–37	31–3–42	273	16	6,288	5·63	354·15	W. H. & T. F. Robinson	Glen Iris Golden Oxford (12694)
Ferndale Jean 6th	A.I.S.	....	10–1–38	27–4–42	273	23	8,229	4·05	333·33	G. W. Marston	Tabbagong Hinkler (261)
Koojan Golden Ripple	Guernsey	7248	26–3–38	7–5–42	273	15	5,985	5·32	318·94	Denmark Research Station	Homestead Ace (1631)
Glanavon Pansy 4th	A.I.S.	....	10–11–37	21–1–42	273	22	7,416	4·22	313·39	Burkitt & Brown	Blacklands Jean's Supreme (1871)
Travalgan Starbright 6th	Jersey	....	31–5–38	16–6–42	273	17	6,021	5·19	312·94	W. H. T. F. Robinson	Glen Iris Golden Oxford (12694)
Tipperary Dove 10th	A.I.S.	....	25–3–38	17–5–42	273	5	7,170	4·11	298·83	W. G. Burges	Blacklands Monarch's Commander (1877)
Yanget Pretty Maid 3rd	do.	....	8–7–38	24–9–42	273	7	6,681	4·41	295·06	W. G. Burges	Sunrise of Parkview (1875) (I.M.S.)
Tipperary Dove 9th	do.	....	2–10–37	10–12–41	273	10	6,150	4·42	271·86	W. G. Burges	Blacklands Monarch's Commander (1877)
Westby Lupin 10th	do.	....	1–8–37	25–10–41	273	17	7,191	3·65	263·15	Burkitt & Brown	Telyarup Duke (956)
Glanavon Fairy 3rd	do.	....	21–4–38	7–5–42	273	7	5,931	4·26	252·95	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Yanget Beauty	do.	....	18–5–38	8–6–42	150	29	5,430	4·00	217·74	B. W. Prowse	Sunrise of Parkview (1875) (I.M.S.)
Chittering Fancy	do.	....	20–10–38	14–11–42	120	38	5,325	4·02	214·59	G. W. Marston	Brackenhurst Conquest (4624)
COWS 4½ YEARS AND UNDER 5 YEARS STANDARD 330 Lbs. OF BUTTER-FAT.											
Grass Vale Design's Maggie	Jersey	71637	25–11–37	3–8–42	273	19	7,902	6·26	495·17	R. H. Rose	Grass Vale Gold Boy (14684)
Glanavon Charmer	A.I.S.	....	24–4–37	27–12–41	273	23	11,244	4·20	472·42	D. Bevan & Sons	Parkview Commodore (306)
Glanavon Ettie	do.	....	25–2–37	14–12–41	273	12	10,326	4·16	429·91	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Denmark Angeline	Guernsey	6956	4–7–37	4–4–42	273	17	7,041	5·61	395·44	Denmark Research Station	Koojan Golden Prosper (2283)
Brookfields Morden Lady 2nd	do.	6838	19–9–37	29–5–42	273	17·5	6,832	5·47	374·29	P. G. Hampshire & Son	Koojan Ace's Majestic (2735)
Crantock Napoleon's Daffodil	Jersey	75813	22–10–37	1–7–42	273	10	5,820	6·37	371·24	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Crantock Silk Socks	do.	70901	6–6–37	12–5–42	273	15	6,735	5·36	361·22	Mrs. G. H. Burnside	Congelin Emminent's Golden (13623)
Koojan Diana	Guernsey	7247	5–10–36	5–9–41	240	20	6,510	5·45	354·96	R. J. Giles	Koojan Ace's Aristocrat (2730)
Melbury Janet	A.I.S.	26505	18–7–37	17–5–42	273	20	8,280	4·27	354·01	G. W. Marston	Telyarup Roosevelt (1538)
Wooroloo Heather	do.	23247	5–11–37	16–9–42	240	12	8,190	4·23	347·04	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Brookfields Loyalty	Guernsey	6837	12–5–37	30–3–42	273	20·5	5,776	5·41	312·91	P. G. Hampshire & Son	Koojan Ace's Majestic (2735)
Warrawong Waybury	do.	8043	15–12–36	24–10–41	210	15	5,775	5·16	298·53	R. J. Giles	Nundorah Climax (1366)
Yanget Pretty Maid 2nd	A.I.S.	28697	28–10–37	17–9–42	273	5	6,315	4·45	281·51	W. G. Burges	Sunrise of Parkview (1875) (I.M.S.)
Westby Dahlia	do.	....	17–9–37	22–8–42	273	9	7,587	3·34	253·63	Burkitt & Brown	Telyarup Duke (956)
Crantock Golden Bell	Jersey	70896	13–8–37	16–6–42	240	5·5	4,515	5·05	228·24	Mrs. G. H. Burnside	Congelin Emminent's Golden (13623)

COWS 5 YEARS AND OVER—STANDARD 350 LBS. OF BUTTER-FAT.

Denmark Dawn 2nd	Guernsey	5439	21-3-35	27-11-41	273	28	9,354	6·43	601·49	Denmark Research Station	Koojan Golden Prosper (2283)
Glanavon Fairy	A.I.S.	20204	22-12-34	27-10-41	273	23	13,689	4·15	568·60	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Glanavon Rosina	do.	....	3-5-37	17-5-42	273	25	11,865	4·60	545·95	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Brookfields Lady Faith	Guernsey	4062	19-6-32	3-10-41	273	23	10,644	4·95	527·51	P. G. Hampshire & Son	Koojan Lord Barclay (1031)
Denmark Rosemary	do.	5451	7-6-36	21-11-41	273	18	7,194	7·13	512·99	Denmark Research Station	Koojan Golden Prosper (2283)
Glanavon Lulu	A.I.S.	....	25-10-36	17-5-42	273	26	11,558	4·33	500·94	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Glanavon Melba	do.	....	21-12-36	20-6-42	273	19	12,327	4·03	497·77	D. Bevan & Sons	Parkview Commodore (306)
Denmark Briar Rose	Guernsey	6959	15-8-37	29-9-42	273	26	9,333	5·32	496·93	Denmark Research Station	Denmark Illustrious (3320)
Wooroloo Bonnie	A.I.S.	18626	29-10-34	1-5-42	273	30	12,210	4·03	492·13	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Blacklands Ettie 9th	do.	9298	24-9-32	28-11-41	273	25	11,970	4·08	489·28	D. Bevan & Sons	Parkview Limelight (370)
Juadine Peerless Lily 9th	Jersey	62336	27-9-35	31-10-41	273	22	8,256	5·89	487·04	Miss L. G. Hancock	Juadine Sunshine (8212)
Lansdowne Morden Lady	Guernsey	3479	10-11-31	25-10-41	273	22	9,111	5·28	481·47	P. G. Hampshire & Son	Koojan Golden Broadcaster (1632)
Wooroloo Freda 2nd	A.I.S.	23245	9-10-35	25-6-42	273	10	12,135	3·94	478·66	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Melbury Red Rose	do.	12587	29-4-34	28-9-41	273	31	12,303	3·87	477·33	B. W. Prowse	Telyarup Roosevelt (1538)
Koojan Ace's Dulcie	Guernsey	5658	6-3-36	12-3-42	273	20	8,040	5·89	473·81	Denmark Research Station	Homestead Ace (Imp.) (1631)
Tipperary Fairy 3rd	A.I.S.	22905	1-9-36	2-10-42	273	26	11,003	4·21	463·40	W. G. Burges	Blacklands Monarch's Commander (1877)
Glanavon Tiny	do.	20212	25-9-34	10-5-42	273	26	11,448	4·03	461·62	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Koojan Ace's Daphne	Guernsey	5657	13-8-34	2-7-42	273	24	8,232	5·51	453·70	A. W. Padbury	Koojan Ace (2270)
Denmark Rosette	do.	6972	21-7-36	6-9-42	273	19	7,767	5·82	452·22	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Doreen	A.I.S.	23238	7-2-37	6-3-42	273	30	10,140	4·44	450·80	Wooroloo Sanatorium Farm	Wooroloo Duke 6th (3622)
Denmark Prosper's Rosa	Guernsey	4127	27-12-32	8 8-42	273	24	8,232	5·42	446·77	Denmark Research Station	Koojan Golden Prosper (2283)
Glanavon Daphne 3rd	A.I.S.	....	13-2-37	21-8-42	273	23	11,889	3·68	438·46	Burkitt & Brown	Parkview Commodore (306)
Colmyn Brown Maggie	Jersey	56859	27-6-35	1-10-42	273	20	8,205	5·29	434·10	Miss L. G. Hancock	Colmyn Prince Victor (10492)
Denmark Rose Dame 4th	Guernsey	5447	13-3-35	4-12-41	273	28	8,349	5·14	429·62	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Lady Betty	A.I.S.	18634	3-8-34	7-3-42	273	29	10,212	4·17	426·81	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Denmark Golden Day	Guernsey	5440	29-7-35	9-11-41	273	23	8,079	5·27	426·48	Denmark Research Station	Denmark Damon (2519)
Koojan Ace's Jean	do.	5660	10-3-36	29-7-42	273	16	7,188	5·85	421·01	A. W. Padbury	Homestead Ace (Imp.) (1631)
Denmark Diana	do.	6963	28-6-36	2-11-41	273	23	7,719	5·39	416·33	Denmark Research Station	Denmark Damon (2519)
Wooroloo Yvonne	A.I.S.	18639	25-2-35	22-1-42	273	27	10,801	3·79	410·31	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Juadine Juliet 8th	Jersey	44518	10-10-32	26-4-42	273	16·5	7,819	5·24	410·23	Miss L. G. Hancock	Juadine Radiance (7598)
Denmark Prosper's Lady	Guernsey	3273	6-12-31	11-10-41	273	17·5	6,757	6·05	409·45	Denmark Research Station	Koojan Golden Prosper (2283)
Glanavon Gold 3rd	A.I.S.	....	24-8-36	31-1-42	273	20	9,480	4·19	397·92	D. Bevan & Sons ..	Glanavon Le Nayler (320)
Leylands Queen	do.	17175	2-8-33	14-7-42	240	28	10,035	3·94	396·03	G. W. Marston .	Parkview Commodore (306)
Brackenhurst Dairymaid .	do	19306	8-11-35	16-5-42	273	22	10,386	3·80	395·61	B. W. Prowse	Thornleigh Champagne (930)
Rosy Hill Mars	Jersey	64109	27-8-35	2-4-42	273	13	6,669	5·86	390·98	A. W. Padbury	Rosy Hill Pearl's Chief (12136)
Glanavon Bluebell	A.I.S.	25157	1-3-36	17-4-42	273	26	8,950	4·36	390·42	G. W. Marston	Glanavon Nimrod (437)
Brookfields Beauty	Guernsey	6831	30-9-36	11-5-42	273	15	6,945	5·55	386·03	P. G. Hampshire & Son	Koojan Ace's Majestic (2735)
Crantock Cream Lass	Jersey	43542	7-6-31	21-3-42	273	23	6,579	5·75	378·71	Mrs. G. H. Burnside	Crantock Starbright's Montrose (5945)

HERD TESTING—*continued.*

COWS 5 YEARS AND OVER. STANDARD 350 LB. OF BUTTERFAT—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk for Period.	Average Test.	Weight of Butter Fat for Period.	Owner.	Sire.
						lb.	lb.	%	lb.		
Wooroloo Empress	A.I.S.	23241	1-11-35	25-9-42	240	8	8,970	4·19	376·19	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Tipperary Maggie 4th	do.	18330	15-9-35	23-8-42	210	26	8,700	4·20	372·42	W. G. Burgess	Blacklands Monarch's Commander (1877)
Brookfields Bess	Guernsey	6832	8-9-37	8-10-42	273	16	6,948	5·29	367·63	P. G. Hampshire & Son	Koojan Ace's Goldseeker (3431)
Wooroloo Sunbeam	A.I.S.	23273	24-10-36	20-3-42	273	18	8,334	4·29	358·29	Wooroloo Sanatorium Farm	Wooroloo Triumph 4th (3627)
Milbank Joan 5th	do.	7411	12-1-32	25-7-42	210	26	9,435	3·78	356·67	G. W. Marston	Parkview Ruler (309)
Denmark Velda	Guernsey	6973	13-7-36	21-11-41	273	22	7,906	4·45	352·55	Denmark Research Station	Denmark Damon (2519)
Wooroloo Pearl 5th	A.I.S.	23264	1-10-36	25-5-42	273	9	8,517	4·13	352·15	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Westby Lupin 3rd	do.	18516	31-8-34	24-3-42	273	11	8,823	3·94	248·34	Burkitt & Brown	Telyarup Duke (956)
Glanavon Doris	do.	10923	1-8-32	20-2-42	273	9	8,772	3·94	345·66	D. Bevan & Sons	Villiers of Darbalara (2386)
Denmark Prosperette	Guernsey	....	17-5-36	11-10-41	273	13·5	6,625	5·19	344·40	Denmark Research Station	Denmark Damon (2519)
Wooroloo Betty 5th	A.I.S.	23232	8-1-37	10-6-42	273	16	8,178	4·19	343·45	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Muresk Rosebud	Guernsey	4752	4-7-33	7-5-42	273	14	6,207	5·50	341·89	Muresk Agricultural College	Minnamurra Plaintiff (1318)
Glanavon Mayflower	A.I.S.	25184	22-4-37	31-7-42	273	11	9,153	3·72	341·02	D. Bevan & Sons	Parkview Commodore (306)
Muresk Mabel	Guernsey	7644	24-6-36	8-2-42	273	7	6,036	5·55	335·05	Muresk Agricultural College	Minnamurra Plaintiff (1318)
Denmark Wild Rose	do.	6974	1-7-36	4-12-41	273	14	6,252	5·33	333·28	Denmark Research Station	Koojan Golden Prosper (2283)
Westby Carnation	A.I.S.	18514	30-5-35	8-9-42	273	24	9,177	3·57	328·07	Burkitt & Brown	Telyarup Duke (956)
Westby Carnation	do.	18514	30-5-35	21-10-41	273	15	8,805	3·65	321·48	Burkitt & Brown	Telyarup Duke (956)
Glanavon Buttercup	do.	25158	4-5-36	22-3-42	240	13	7,320	4·16	304·68	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Glanavon Rosalie	do.	20210	12-2-35	12-8-42	273	18	8,109	3·66	296·93	D. Bevan & Sons	Parkview Commodore (306)
Claremont Maggie 8th	do.	19604	12-11-35	12-7-42	273	18	7,524	3·88	292·59	Claremont Hospital for Insane	Wooroloo Persimmon (2972)
Muresk Trixie	Guernsey	6067	29-3-35	28-2-42	273	14	5,412	5·37	290·69	Muresk Agricultural College	Muresk Golden Chief (2925)
Westby Ulery	A.I.S.	15143	15-6-33	1-12-41	240	16·5	8,025	3·61	290·25	Burkitt & Brown	Telyarup Duke (956)
Denmark Rose Ophelia	Guernsey	5448	11-7-35	20-12-41	273	22	5,616	5·10	286·91	Denmark Research Station	Koojan Golden Prosper (2283)
Denmark Red Rose 9th	do.	4128	13-1-33	11-8-42	240	9	4,880	5·85	285·81	P. Berridge	Koojan Golden Prosper (2283)
Denmark Bonnie	do.	5437	22-7-35	19-3-42	273	13	5,559	5·10	283·68	Denmark Research Station	Denmark Damon (2519)
Westby Pearl	A.I.S.	15140	19-2-33	18-10-42	273	11	7,743	3·66	283·65	Burkitt & Brown	Telyarup Duke (956)
Muresk Jessie	Guernsey	7641	2-5-37	8-9-42	273	5	5,550	5·10	283·52	Muresk Agricultural College	Muresk Homestead (2075)

Crantock Napoleon's Primula 3rd	Jersey	66068	21–6–36	13–2–42	273	16·5	5,584	5·07	283·46	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Glanavon Sadie 2nd	A.I.S.	25192	9–2–37	24–4–42	150	46	6,960	4·05	281·91	D. Bevan & Sons	Glanavon Nimrod (437)
Greenmount Starbright's Marinora	Jersey	34841	31–5–30	19–10–41	240	14	5,430	5·15	280·11	A. G. Scott	Werribee Starbright's King (2602)
Moorlands Helena	do.	49635	18–5–33	7–3–42	210	24	5,535	4·88	270·15	A. G. Scott	Melrose Clarion (6931)
Greenmount Golden Wonder	do.	61975	28–3–35	22–7–42	210	13·5	5,775	4·67	269·76	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Leylands Fairy	A.I.S.	17164	2–7–34	9–7–42	210	25	6,870	3·91	268·65	B. W. Prowse	Thornleigh Champagne (930)
Westby Lupin 10th	do.	28525	1–8–37	13–9–42	273	10	7,560	3·55	268·49	Burkitt & Brown	Telyarup Duke (956)
Muresk Desdemona	Guernsey	7633	31–5–36	3–7–42	273	9	5,547	4·83	268·04	Muresk Agricultural College	Muresk Homestead (2075)
Hopelands Silverbelle	Jersey	67044	24–7–34	10–11–41	240	7	5,182	5·04	261·54	A. G. Scott	Melrose Sultan (6930)
Hopelands Silverbelle 2nd	do.	62171	24–6–35	13–6–42	240	18	5,520	4·73	261·54	A. G. Scott	Melrose Sultan (6930)
Tipperary Dove 8th	A.I.S.	22904	6–10–36	2–5–42	273	7	6,321	4·11	260·04	W. G. Burges	Blacklands Monarch's Commander (1877)
Hopelands Helena	Jersey	62170	28–6–35	2–11–41	273	11·5	5,329	4·80	256·23	A. G. Scott	Preston Prospector (11024)
Tipperary Lady May 2nd	A.I.S.	18328	8–10–35	29–4–42	240	15	6,510	3·69	240·83	W. G. Burges	Blacklands Monarch's Commander (1877)
Westby Pearl	do.	15140	19–2–33	19–11–41	273	14	6,342	3·79	240·52	Burkitt & Brown	Telyarup Duke (956)
Hopelands Silverbelle 3rd	Jersey	67045	18–5–36	19–11–41	273	6	4,840	4·82	233·52	A. G. Scott	Melrose Sultan (6930)
Greenmount Bonetiennes Twinklette	do.	44202	6–8–33	23–1–42	273	12	4,536	5·03	228·72	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Hopelands Biddy	do.	67043	17–10–35	26–6–42	210	9	4,290	4·91	210·90	A. G. Scott	Melrose Liberty (7973)
Hopelands Vera	do.	62172	7–11–34	17–12–41	240	5	4,410	4·63	204·45	A. G. Scott	Colmyn Captain Mac (5855)
Hopelands Belvedere 2nd	do.	....	10–10–32	27–7–42	180	17	4,620	4·41	203·76	A. G. Scott	Moorlands Carpus (7989)
Grass Vale Golden Cream 15th	do.	66783	3–9–36	19–5–42	240	6	3,540	5·62	199·08	A. G. Scott	Selsey Gay Boy (15134)
Greenmount Sweet Lass	do.	44204	14–7–33	26–6–42	150	20	4,515	4·29	194·13	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Greenmount Golden Lass	do.	71653	30–9–36	18–9–42	120	24	3,660	4·46	174·36	A. G. Scott	Bellefaire Bonaparte's Bonetienne (9224)
Grass Vale Nora Lady	do.	66788	1–12–36	8–9–42	150	14	2,910	5·15	150·00	A. G. Scott	Selsey Gay Boy (15134)
Hopelands Silverbelle 3rd	do.	67045	18–5–36	19–10–42	120	13·5	2,715	4·56	123·96	A. G. Scott	Melrose Sultan (6930)
Greenmount Flash Maid	do.	61972	28–1–36	4–3–42	210	4	2,805	4·24	119·04	A. G. Scott	Greenmount Golden Flash (12736)
Devonia Silver Queen	do.	66223	18–11–35	13–12–41	90	22·5	2,295	4·32	98·19	A. G. Scott	Sabina Vale Silver Chief (13223)
Greenmount Marinette	do.	34840	24–5–31	17–5–42	180	7	2,100	4·26	89·49	A. G. Scott	Grantham Starbright's King (5796)
Norric Peggy	A.I.S.	26939	14–4–35	11–7–42	60	35	2,220	3·90	86·67	W. G. Burges	Warwick Rufus (3595)
Hopelands Northern Biddy	Jersey	....	17–10–35	1–9–42	120	10	1,740	4·79	83·46	A. G. Scott	Travalgan Northern Noble (10124)
Brookfields Betty	Guernsey	6833	3–10–37	22–12–42	30	47	1,410	5·14	72·51	P. G. Hampshire & Son	Brookfields Majesty (3254)

The Hosier System.

A. B. ADAMS.

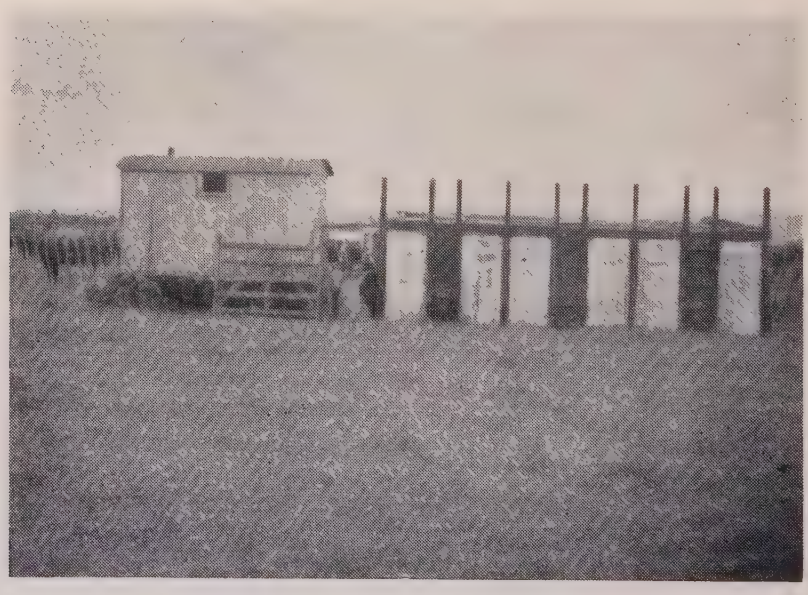
The Hosier system is a method of handling a dairy based on an open air system with transportable bails to take care of milking operations.

Mr. Hosier had a holding of several thousand acres on Salisbury Plain, Wiltshire. He wished to change from dry stock and sheep to whole milk production. To do this, and comply with the Health Acts in the normal way, it would have been necessary to erect buildings at a cost of several thousand pounds. To overcome this difficulty he thought out a plan of building bails on wheels. These allowed of milking under shelter on clean grass, and as soon as this area became fouled with droppings the bail was moved to fresh ground. When I visited him in June, 1937, Mr. Hosier had several units in action.

Each unit consisted of a portable shed with six bails, and a six unit milking machine. The engine was housed in a shepherd's hut, also on wheels. The yard was of wire and chestnut wood stakes. There were 60 cows in each herd unit in charge of a man and a boy.

In operation the cows grazed the area adjacent to the bails. At milking time the cows were brought into the yard, milked in the bails, where they received their ration of concentrated food, and when milked out they were let out through the back of the shed by the dairyman pulling a shutter up and so allowing the cow to walk out. The layout and method will be seen in the illustrations.

There is a manger for the concentrate in front of each cow. It folds up as the shutter is raised. It was explained to me that at first the manger was on a door which opened, but the cows already let out were apt to hang around and interfere with those about to leave the shed. By folding the manger out of the way it got over this difficulty. The concentrate is held in hoppers above and to the side of the mangers, and the amount can be increased by pulling and pushing



Rear view.

back a rod which controls the flow of the food into the manger. One pound was let into the manger for each time the rod was pulled out and pushed back. By this arrangement the concentrate was rationed according to each animal's production.

Side view, showing cow walking out.

Front view, showing part of shed, one cow leaving, another being milked.

Showing hut for engine and concentrates, also type of fence.

The Hosier system not only allows of clean production with a minimum of outlay, but at the same time greatly benefits the pasture by treading and added fertility.

It will be realised that treading is beneficial to light land; the system is not recommended for heavy clay soils.

It saves labour as no cleaning of sheds and casting out of manure is required.

To summarise:—

The Hosier system is suitable for medium and light soils and has the following advantages:—

(1) It saves outlay on buildings.
(2) It saves labour in dealing with droppings.
(3) It greatly improves the pasture where the outfit has been used.

Acknowledgment.

The following acknowledgment was omitted from the report of trials with Western Australian timbers for the manufacture of butter boxes in the March, 1943, issue of this Journal.

"The following assisted in carrying out the trial and the examination of the boxes and butter after storage:—

Messrs. J. O'Donnell, Gregson & Gorringe, Forestry Department; P. Quigley, Department of Commerce; N. M. Fox, Butter Manufacturers' Association; C. W. Thompson and J. Wood, South-West Co-operative Dairy Farmers; R. A. Paul and P. C. Cousins, Department of Agriculture.

Mr. F. Simper was responsible for the manufacture of the boxes, while the facilities at the South-West Co-operative Dairy Farmers' butter-cutting floor were made available by the courtesy of Mr. H. D. Gorrie, for the storage and examination of the butters."

Rubber Production in Relation to Western Australia.

Part II.

A. J. Millington.

Reference was made in the first part of this contribution to the possibility of producing natural rubber in Western Australia by means of the Mexican rubber shrub *Parthenium argentatum*. Experiments have also been conducted with the Russian dandelion, *Taraxacum Kok-saghyz*. Some millions of acres of this crop, by report, have been raised by the Russians, principally in the Eastern Ukraine and by the Germans in Poland. As mentioned previously, it is customary to mix a proportion of the natural product with the synthetic in automobile tyres and this, probably, is the reason for the cultivation of Kok-saghyz as a supplementary source of rubber. Since the plant is harvested in the second year of its growth, it is productive in a much shorter period than are most natural rubber plants and it therefore appeals as an emergency source.

Kók-saghyz root—about half natural size.

Description and Habitat.

Taraxacum Kok-saghyz is a native of the provinces which lie between Russia and Chinese Turkestan. A temperate climate with 26 inches of annual rainfall is required. The growth habit is similar to that of the local flatweeds, *Hypochoeris* spp., a rosette of leaves forming, from which arises flower heads. The rubber is formed in the peripheral layers of the rhizomes and for that reason plants with branching roots and hence greater surface areas, are preferred.

Cultivation and Processing.

The crop is sown normally in shallow rows 13 to 18 inches apart, with 2 to 4 inches spaces between plants. Weeds must be vigorously suppressed, especially in the early stages by inter-row cultivation and hand weeding.

Seed is collected at the end of the first flowering season after which the leaves die and the plant becomes dormant. At the close of the second year, the whole plant is uprooted, the roots dried and ground to powder. The rubber is then separated in water or alkaline solution by flotation or contrifuging.

Experiments in W.A.

Seed of Kok-saghyz was obtained from Russia by the Australian Council for Scientific and Industrial Research and made available to this Department. Plantings were made at Margaret River, Busselton, Wokalup, Boyup Brook and Hamel in the South-West and also on the wheat belt research stations for observational purposes.

Germination was very much delayed in most instances, but such plants as did appear made little growth and died out in November. For successful cultivation in Western Australia, it appears that Kok-saghyz would require irrigation and also cultural conditions similar to those given to vegetables. Under present circumstances in view of the relatively low yields of rubber per acre, it does not appear to merit further experimentation.

Full grown Kok-saghyz plant in bloom.

Acknowledgments.

Grateful acknowledgment is made to the Deputy Conservator of Forests, Mr. T. N. Stoate, to Mr. Ross of the Forestry Department and to Messrs. A. L. Hamilton and J. M. Nelson of the Dairy branch for their assistance in this investigation.

The interest and enthusiasm of Dr. A. E. V. Richardson of C.S.I.R. made the experiments with both Guayule and Kok-saghyz possible, firstly by supplying seed and secondly, current literature dealing with these specific crops. Assistance has also been received from Professor Trumble of the Waite Institute, Adelaide, on technical matters pertaining to Guayule. The author would like to take this opportunity of expressing his thanks for their ready assistance and co-operation in these investigations.

Fodder Conservation.

M. Cullity and H. G. Cariss.

In a short article such as this, it is only possible to deal very broadly with this important phase of farming. In our dairying districts, for instance, fodder is wholly conserved for the feeding of the dairy herds, whereas in the wheatbelt, horses and sheep are the main consideration, with cattle normally of minor importance.

Though the requirements in the dairying districts and the wheatbelt areas differ, the underlying principles of fodder conservation are the same. In some areas almost the whole of the farm income is derived from stock. In others stock are of relatively minor importance.

The conservation of fodder is a very ancient practice as is illustrated by the biblical example of storing up reserves of fodder during the years of plenty in order to provide for the lean years. It can be regarded in the same light as the insurance which can be obtained against loss of buildings and plant. In the Northern Hemisphere the production of fodder supplies for the winter months is an integral part of the routine farm practice. The drought periods which occur annually in Australia are of a similar nature, but usually insufficient provision is made for them in the form of fodder conservation.

The carrying capacity of the farm is largely determined by the area of natural and sown pastures, which will vary from year to year in both quality and quantity. It may be increased by the sowing of fodder crops, particularly for early green feed.

It may be further improved by up to date methods of pasture development and management. These methods alone, however, are not altogether satisfactory, for they still leave the farmer depending on the vagaries of the season. Each year periods of high and low levels of nutrition occur, and in consequence, the carrying capacity is determined by the paddock feed available during the lean periods of the year unless reserves of fodder are available. Adequate quantities of conserved fodder will enable more stock to be safely carried during these lean periods.

Another important advantage of conserved fodder which is not always realised, is that it provides fodder of a better quality than is usually available in the paddock of the lean period. Better quality fodder means higher digestibility, higher protein, mineral and vitamin content, and in the case of silage, a succulent fodder for lactating animals.

The provision of better quality fodder will mean the maintenance of the health and condition of all stock, and higher production. Breeding stock kept under such conditions will produce strong and healthy offspring.

Conservation of fodder on the farm can be considered under two headings. The first is the need for seasonal reserves or seasonal supplies; the term reserves rather implying that they are only to be used when necessary. Actually the fodder is conserved for definite purposes—namely, for the feeding of the working horses over most of the year, and for other stock during that period when natural pastures in any normal season are deficient in quality and quantity. This latter is a drought period, which annually occurs in the agricultural areas of this State, when the breeding stock and young growing animals

require rations for growth and maintenance. Such provision avoids the necessity of reducing stock numbers, and enables the carrying capacity to remain at a more or less even level throughout the year. In the dairying districts these reserves are mainly used from about January to July, after which comes the flush period of green feed. One of the most important periods for the utilisation of these is after the first rains, when the paddock grazing is poor, and there is little body in the new green pasture. Hand feeding at this time also enables the young pasture to become firmly established. Under the second class may be considered drought reserves, which do not always receive the attention they should. This applies more particularly to the wheatbelt than to the dairy districts, where the rainfall is more assured. Reservations for this purpose provide fodder sufficient to enable the carrying capacity to be maintained through adverse seasons, and should therefore consist of at least sufficient for one year's feeding. In seasons like the one experienced in 1940-41, it is necessary to hand feed the farm stock through the greater part of the year. Such seasons, fortunately however, occur only at irregular intervals, and such drought reserves may not be required, at least to their full extent more than say, one year in ten. Whenever possible, however, these reserves should be built up to the original level.

In preparing a fodder conservation plan, due consideration must be given to the types of stock carried, the carrying capacity of a property at the time, and any probable increase. Provision must be made for ample quantity and quality of each type of fodder for proper rations, and the storage must be suitably situated in relation to the feeding of the animals.

Fodder may be conserved either as hay, silage, or grain, in all cases the material must be stored in such a manner that it is given the maximum protection from weather, fire and vermin hazards. Extra protection will be necessary if the fodder is to be stored over a long period, with the added safeguard of insurance.

HAY.

Hay is usually made either from cereals, or grasses and clovers. In the latter case, it is known as meadow hay. In the wheatbelt hay-making is mainly confined to the cereals wheat and oats, meadow hay being only of importance in the higher rainfall districts. When making cereal hay, the crop should be cut at such a stage that the maximum nutritive value is retained. Immediately after cutting, the hay should be stooked, preferably in large round stooks, in order to avoid the loss of nutrients by weather.

Stacking.

Stacking should be undertaken immediately the right stage of curing has been reached, that is when a straw from one centre of the stook will not show moisture when bent. The stacks should be well constructed, and if to be kept for long periods, should be thatched. When selecting the stack site, adequate provision should be made for protection from weather, fire and vermin hazards.

In the dairy districts a greater bulk of hay is made from clover and grasses. As meadow hay should have a high protein content, it is advisable that it should contain a high proportion of clover. The colour must be preserved. It has been shown that cows fed on fresh green fodder assimilate more calcium than they do from dried forage, and hay cured under protection from the sun was superior

to that cured under exposure to sunlight. Therefore, hay should not be unduly exposed to the sun after it is cured, and it is essential that every endeavour should be made to get the crop under cover as quickly as possible.

When to cut.

Subterranean clover should not be cut before the flowers appear at the ends of the runners, as at this stage the major proportion of the nutrients are distributed throughout the plant. Sufficient seed for reseeding will have already set from the flowers, which were nearer the centre of the plant. If the weather is favourable, raking into wind-rows should not be delayed more than one day. In good hay-making weather, the material from the wind-rows may be taken next day direct to the shed, stack, or baler. In the event of rain, it may be necessary to turn the wind-rows or cocks, but undue handling should be avoided, otherwise loss of leaf will occur. This loss should be avoided, as much as possible, as it is the leaf which has the highest nutritive value, containing more protein and less fibre.

Baling.

The baling of hay is becoming more popular, and where sufficient labour is available, it will be found to have several advantages over the usual haystack. The material is much easier to handle, and avoids much lost space when stored. The colour is preserved better, there is less waste, more exact quantities can be fed, and weather, fire, and vermin hazards are reduced.

SILAGE.

For the long or short term storage of fodders in a succulent, palatable and nutritious form, the ensilage of crops and of surplus pasture is of the greatest value. Silage may be stored for many years without deterioration, and provision for it should be made for dairy cattle and where export lambs are bred. Ensilage could easily become an integral part of the harvest routine.

Instead of commencing with hay-making, ensilage would be the first operation. Unfortunately, under our Western Australian conditions it is the relatively high labour requirements which deter many farmers from attempting to make silage. For silage the material should not be too mature, or otherwise a poor quality product will result.

To produce good silage, it is not essential to incur the expense of overhead silos. Excellent results can be obtained from pit or trench silos, or stack silage. Of these the trench silos are to be preferred in the wheatbelt, particularly for long term storage, and the stack silage for the dairy districts. In the dairy districts cheap timber silos are sometimes constructed, and have proved quite satisfactory.

When making silage, the material should be pressed tight to exclude air. With stacks, the edges should be trampled, and the centre left slack. Trench silos can be constructed cheaply with the aid of a plough and scoop. They should be situated on a high, well drained position, and protected from flood water.

The secret of making good silage lies in early cutting, quick carting, tight packing, and the exclusion of all air.

SUPPLEMENTARY CONCENTRATES.

Hay and silage, together with any available natural pasture, form a bulky portion of the ration. Working, breeding, and young stock, however, require in addition, a concentrated food of some sort. The most commonly utilised are the

cereal grains, although lupins and peas, which are usually fed direct in the paddock without harvesting and storage, are of much higher protein content. The cereal grains themselves can form an excellent maintenance ration, particularly for sheep, but they lack the bulk necessary for the proper working of the animal machine. As with the bulky fodders, the grains should be carefully stored, preferably in bulk in converted sheds or specially constructed tank silos. A silo to hold a thousand bags would cost approximately £100; one for 300 to 400 bags, £16 to £20.

Several small tanks are preferable to one or more large ones, and they should be conveniently placed. Storage in bags, except for very short periods, is unsatisfactory. The quantities conserved should be based upon the maximum requirements, and not on the possibility of paddock feed being always available.

Quantity to Feed.

For the wheatbelt the following is a suggested basis for quantities:—

(1) Sufficient cereal or meadow hay to supply all sheep at 1 lb. per day for four months.

(2) Sufficient grain to supply weaners and mated ewes with ½ lb. per head per day for 2-3 months.

(3) Sufficient silage for ewes breeding fat lambs at 1 lb. per day.

(4) For horses at heavy work 25 lb. chaff and 8-10 lb. of grain per day, on light work grain can be reduced.

(5) For milking cow 12 lb. chaff and 3 lb. grain depending on there being some pasture available.

It is estimated that for a 1,000 acre property carrying 14 horses, including 10 workers, five mixed cattle, and 550 sheep, including 250 breeding ewes, the normal annual requirements would be 60 tons hay and 300 bags of oats, or 250 bags of wheat, and provision for these would necessitate approximately 100 acres being set aside. In addition, the drought reserves must be maintained equivalent to one year's requirements.

In the dairy belt normal quantities to conserve are the equivalent of 2½ tons hay per cow, which includes a margin for the bull, horses, and young stock. The average cow can consume about 25 lb. good hay per day. For summer milking, in the absence of green pasture, 40 lb. silage per day should be fed plus about 15 lb. of good hay. High producing cows will require some concentrate, grain, etc., in addition, particularly where the quality of silage and hay is inferior.

To summarise, a certain level of hand feeding is necessary on every farm during the period of poor grazing to maintain the carrying capacity on a somewhat similar level to that of the period of good growth. If this is not done, some stock may have to be disposed of at very poor prices, or expensive fodders purchased. Reserves above this level are essential to provide against drought periods. These reserves must be considered as a form of stock insurance to guard against those abnormal years, which do occur on occasions, with disastrous results to farmers who have not made this provision.

Agricultural Broadcasts.

The following programme of Agricultural Talks has been arranged for the January-March quarter and will be broadcast from Stations 6WF and Regionals at 9.15 p.m. each Thursday.

Date.	Talk Prepared by:	Title.	Summary.
	I.—FARMERS IN A CHANGING WORLD.		
Jan. 13	L. T. Jones, Agricultural Adviser	Phosphates in Agriculture	A brief historical survey of the use of phosphatic manures will be given, including consideration of the uses of phosphatic fertiliser and an account of world phosphate supplies.
Feb. 10	Prof. G. A. Currie	Agricultural Education	Desirable objectives in rural education will be discussed. Equal opportunity to enjoy all stages of education should be available to country and town children, and all hindrances to this ideal should be removed.
Mar. 9	A. B. Adams, Agricultural Adviser	Indian Agriculture	A brief account will be given of land tenure and agricultural production in India.
	II.—TOPICAL ITEMS.		
Jan. 20 Feb. 17 Mar. 16	G. K. Baron Hay, Under Secretary for Agriculture, will discuss current events in agriculture		
	III.—FARMERS' FORUM.		
Jan. 27 Feb. 24 Mar. 23	Discussion on topics submitted by farmers—Arranged by G. A. Currie, Professor of Agriculture, University of Western Australia		
	IV.—TECHNICAL TALKS.		
Jan. 6	C. F. H. Jenkins, Government Entomologist	Some Summer Pests of the Vegetable Garden	A brief description, together with an outline of the life history of some of the commoner pests, will be given in conjunction with recommendations for their control.
Feb. 3	H. R. Powell, Superintendent of Horticulture	The War-time Marketing of Apples and Pears	The formation of the Apple and Pear Acquisition Scheme and its effect upon the economic position of W.A. apple and pear growers will be discussed.
Mar. 2	M. Cullity, Superintendent of Dairying	Wartime Problems in Dairying and Pig Raising	The problems, and what is being done to remedy them will be discussed.
Mar. 30	W. P. Cass Smith, Plant Pathologist	Some Plant Diseases of Economic Importance	The effects of plant diseases on the production of high priority crops will be outlined and some diseases will be discussed more fully. These will include Flax Rust, Damping-off of Vegetable seedlings, Citrus Brown Rot, and Black Rot of Cabbage.

5
TP6